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February 1973

TECHNICAL EVALUATION OF THE 8-INCH MAJOR CALIBER LIGHTWEIGHT GUN MOUNT, MARK 71 MOD 0

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1. NWL Technical Report TR-2854 of February 1973 "Technical Evaluation of the 8-Inch Major Caliber Lightweight Gun Mount, MARK 71 MOD 0" contains two errors. The following pen-and-ink corrections should be made by addressees:

a. Interchange the page number and legends on pages A-19 and A-20.

b. The figure on page A-17 should be labelled "Figure 18", "Pressure Transducer Locations - MARK 71 MOD 0 8"/55 MCLGM".

F. W. Kasdorf

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by

D. L. Bowen
Test and Evaluation Department

FOREWORD

This is the final report on the technical evaluation of the prototype 8"/55 Caliber Gun Mount, MARK 71 MOD 0. This work was conducted under NAVORD ORDTASK 553 111 090 1.

This report was given technical review by P. J. Olenick, Jr. and H. P. Caster of the Project Engineering Division of the Test and Evaluation Department.

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Department

ABSTRACT

A technical evaluation was conducted on the 8-Inch Major Caliber Lightweight Gun Mount MARK 71 MOD 0 at the Naval Weapons Laboratory between 24 September and 12 November 1971. The evaluation included determining performance parameters of the laying and loading systems, electrical power consumption levels for the mount, checking misfire and regunning provisions, a safety analysis, and firing tests. During the firing tests:

a. The mount was proofed satisfactorily.

b. Rate of fire of the mount was determined to be 11.7 to 12.6 rounds per minute.

c. Accuracy data were gathered indicating that round-to-round accuracy was satisfactory; although, a new 8-inch range table is recommended.

d. Barrel life and velocity loss data were examined (including that from the operational evaluation) and, although too limited to be conclusive, the data do not indicate barrel wear and velocity loss to be excessive.

e. A gun blast profile for the gun was established, blast being slightly less severe than that of an 8-inch bag gun.

f. Smoke and carbon monoxide measurements were taken indicating it would be unsafe to circulate air within the mount to a ship's manned space during firing or for maintenance personnel to enter the mount after firing until the mount is purged.

During the testing, several problems were encountered which required minor design changes by the contractor, and several changes are recommended for incorporation in the production version. After completion of the technical evalutation, performance of the mount was judged acceptable and certification for release to operational evaluation was recommended.

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I. INTRODUCTION

The Major Caliber Lightweight Gun Mount (MCLGM) is a result of Navy and Marine Corps efforts beginning in 1960 to provide the fleet with the first major caliber gun mount to be designed since the end of World War II. This mount would provide firepower necessary to support troops ashore at ranges well beyond that of 5"0 guns and would provide greatly increased firepower for the fleet, particularly for smaller ships. A 175mm/60 caliber mount was specified by Reference 1 because of the potential advantages of achieving commonality in ammunition with the Army 175mm gun. Northern Ordnance Division of FMC Corporation at Minneapolis (NOD/fmc) was awarded the contract to design and develop the mount. A prototype was fabricated and subjected to testing at NOD/fmc, including a 50,000 cycle life and reliability test on the loading system. The mount was disassembled and delivered to the Naval Weapons Laboratory, Dahlgren, Virginia in August 1970 where it was reassembled, checked, proof-fired and evaluated to verify that contract requirements were met.

The Army, however, developed only one type of projectile for an anticipated family of ammunition; terminated plans for future ammunition development; planned the phaseout of the 175mm gun; and commenced development of an "up-gunned" 8-inch howitzer. Accordingly, the original SOR, Reference 1, was revised and superseded by Reference 2 in October 1969. The MCLGM was directed to be an 8-inch gun in production using the basic design established in the development of the 175mm prototype. To meet these new requirements, a program was authorized in February 1971 to convert the prototype MCLGM from its 175mm/60 configuration to an 8"/55. Thus, the Naval Weapons Laboratory, by Reference 3, was assigned the responsibility to effect this conversion and to evaluate the 8"/55 MCLGM MARK 71 MOD 0.

The oscillating assembly was returned to NOD/fmc in March 1971 for modification of the recoil and counterrecoil system to handle the increased loads when firing 8"0 MARK 25 projectiles. Since the cartridge case remained the same for both the 175mm and 8"0 applications, only minor modifications were required to the ammunition handling system to accommodate the heavier projectile. These were accomplished on the mount without removing it from its permanent emplacement. Two 175mm liners were converted to an 8"0 by Watervliet Arsenal. A four caliber extension was added to one liner so that it might be used in the mount, the second liner was converted to an 8"/51 caliber test gun for interior ballistic development programs. Two new 8"/55 caliber liners were also machined from new forgings. The converted oscillating assembly was returned to NWL in August 1971 and the mount was reassembled. The 8"0 MCLGM prototype mount was proofed with the EX 28 MOD 0 liner (with the extension) on 3 September 1971.

Reference 4 requested a concurrent evaluation of the 8"0 MCLGM MARK 71 MOD 0 at NWL Dahlgren, however, a separation of the Technical and Operational Evaluations were subsequently authorized and they were performed by NWL and OPTEVFOR, respectively. Both evaluations have now been completed. A preliminary report of results of the technical evaluation was submitted by Reference 5, and this document serves as the final report. Results of the Limited Scope Operational Evaluation (Project 0/S 173) were reported by Reference 6.

The general objectives of the Technical Evaluation were to demonstrate mount performance parameters and to assure that the system was in suitable condition to undergo a Limited Scope Operational Evaluation (OPEVAL). The use of the term "OPEVAL" elsewhere in this report refers to this Limited Scope Operational Evaluation which was conducted at NWL without a complete system evaluation of fire control and ship installation interfaces. An at-sea OPEVAL of the MARK 71 MOD 0 mount was subsequently recommended in Reference 6. The technical evaluation was begun on 24 September 1971 and concluded, except for several tests of secondary importance, on 12 November 1971. The OPEVAL was begun on 15 November 1971 and concluded on 7 January 1972. During January and February 1972, the Technical Evaluation was completed. Although the results of the OPEVAL are reported elsewhere, (Reference 6) firing data accumulated are included here since they apply to such items as ballistic performance of the mount which is of interest from the technical viewpoint.

II. DESCRIPTION OF THE MOUNT

A. General

The 8"/55 Major Caliber Lightweight Gun Mount MARK 71 MOD 0 consists functionally of three systems. A gun laying system positions the gun while the gun loading system automatically loads single rounds of ammunition into the breech, completes the firing circuit, and disposes of empty cases. A control system regulates and monitors mount operations. Characteristics of the mount are listed in Table 1.

B. Major Units

The major units of the 8"/55 MCLGM are: (See Figure 1 of Appendix A and Table 2.)

Upper Structure. The primary components of the upper structure are the stand, carriage, slide and shield. They are all above-deck components.

Stand. The stand is a circular weldment on the open deck that forms a bearing and rollerpath foundation for the mount's rotating structure. A ring gear on the stand mates with a drive pinion to move the rotating structure in train.

Carriage. The carriage consists of a base ring and two trunnion supports (see Figure 2 of Appendix A). All components of the upper structure are mounted on the carriage. A water shield and a water seal are mounted to the stand and carriage to protect the thrust and radial roller bearings from water in a shipboard installation. The train stowing pin is used during mount transport or major repair to lock the gun mount carriage. The pin is installed through a hole in the base ring into the stand. The hole, which is located near the rear of the mount, is covered unless the pin is in place. The upper accumulator is located on the carriage. It supplies hydraulic fluid to the gun loading system components on the rotating structure.

Slide. The slide (see Figure 3 of Appendix A), which is a rectangular wildment with an integral trunnion on each side, is supported by the carriage trunnion supports. The slide contains components of the gun loading system for firing and for disposing of empty cases. The gun barrel which fits into the gun housing, combines with the slide to make up the oscillating assembly. The elevation system moves the oscillating assembly through a gear segment on the bottom of the slide to elevate or depress the gun.

TABLE 1

Mount Characteristics

Ammunition	8"/55 MARK 25 projectiles with new design cartridge assembly.
Rate of fire	12 rounds per minute
Train limits	300 degrees (150° right or left)
Elevation limits	-5 degrees to +65 degrees
Train velocity	30 degrees per second
Train acceleration	60 degrees per second per second
Elevation velocity	20 degrees per second
Elevation acceleration	40 degrees per second per second
Retardation force	216,000 pounds
Length of recoil	36 inches
Mount height (above mounting surface)	168 inches
Trunnion height (above mounting surface)	105 inches
Base ring diameter	246.375 inches
Working circle (including barrel)	394.5 inches
Clearance circle (center of mount to 18 inches beyond shield)	175.3 inches
Mount weight	170,000 pounds
Loader capacity	75 rounds
Power (peak running load)	679 Kw

TABLE 2

Major Components of the Mount

Component	MARK	MOD
Stand	28	0
Carriage	41	0
Elevation Power Drive	72	0
Elevation Receiver-Regulator	56	0
Train Power Drive	73	0
Train Receiver-Regulator	55	0
Slide	34	0
Gun Housing	21	0
Loader	15	0
Shield	67	0
Gun Mount Control	116	0
EP 1 Panel	294	0
EP 2 Panel	295	0
EP 3 Panel	293	0
Upper Accumulator Power Drive	74	0
Lower Accumulator Power Drive	75	0
Gun Barrel	EX 28	0
	EX 28	1
	EX 30	0

Shield. The shield is a streamlined aluminum cover that mounts on the carriage base ring to protect the above-deck components. The shield has a gun port on the front, left and right access doors, and a circular access cover on the rear. A gun port shield, through which the gun barrel protrudes, moves with the oscillating assembly, keeping the gun port covered.

Gun Laying System. The gun laying system consists of the train and elevation system. The train system moves the rotating structure in the deck plane; the elevation system moves the oscillating assembly perpendicular to the deck plane. Both systems mount on the carriage.

Train and Elevation Systems. The train and elevation systems are similar. They are electrically powered hydraulic drives, each consisting of an electric drive motor, CAB (combination A and B end) units, and a gear-reduction and drive pinion. The train drive pinion revolves around the train circle gear in the stand; the elevation drive pinion moves the gear segment on the slide. The train and elevation systems are controlled by an electronic servo control unit in the EP-2 panel and a receiver-regulator mounted on each CAB unit. Air motors form an auxiliary and emergency power source to drive the train and elevation system.

Automatic Two-Speed Control. A two-speed synchro system controls the gun laying system. The one-speed synchro positions the mount within two degrees of the gun order. When the error signal is reduced to 2 degrees of arc, the 36-speed (fine control) synchro assumes position control of the mount.

Remote and Local Control. A control switch on the EP-2 Control Panel is positioned to select the mode of control for the gun laying systems. Weapons Control (Dummy Directors at NWL) control the train and elevation systems in remote control. The train and elevation systems are controlled locally from the EP-3 Test Panel for test or maintenance.

Automatic Limit-Stops. Both train and elevation systems have a pointing cutout system and a limit-stop system to prevent the gun from moving into specific zones where damage would result. In addition, if a failure of the pointing cutout and limit-stop systems allows the gun to travel beyond its maximum safe limits, emergency limit-stop valves are actuated which set the power-off brake and open safety relief valves to halt the gun mount.

Power-Off Brakes. The power-off brakes hold the train and elevation drives whenever the systems are shut down, or stop, and hold them in the event of a power failure. When the train and elevation systems are activated, the hydraulic system releases the power-off brakes.

Gun Loading System. The gun loading system loads ammunition into the breech, fires the round, extracts the empty case from the breech, and ejects the case from the mount. Components of the gun loading system are: loader drum, hoist, cradle, rammer, case extractors, breechblock, empty case tray and empty case ejector, which are all powered by the lower and upper accumulator systems.

Lower and Upper Accumulator Systems. The accumulator systems are sources of hydraulic power for gun loading system components. The lower accumulator supplies power to the lower structure, and the upper accumulator supplies power to upper structure components. The upper and lower systems each employ both main and auxiliary motor/pump assemblies to produce hydraulic power. The main pumps provide full power for the automatic loading system, while the auxiliary pumps provide only limited power for emergency or check-out operations in step mode.

Loader Drum. The loader drum, located below the stand and on the mount's vertical centerline, supports 25 ammunition clips. Each clip stores three rounds of ammunition and is positioned in a clip track on the drum. These clip tracks mate with transfer drive tracks and strikedown station tracks to guide the clips from the transfer station to the upper hoist or to the strikedown hoist. The upper hoist is on the vertical centerline of the mount. The strikedown hoist is outboard of the drum.

Hoist. The hoist receives individual rounds of ammunition from the transfer station and raises them into the cradle on the rotating structure.

Cradle. A cradle moves single rounds of ammunition from the hoist to the slide in alignment with the barrel. When aligned with the hoist, the cradle, being on the centerline of mount rotation, can receive rounds while it rotates with the upper structure. After the cradle raises and is latched to the slide, the rammer, which is mounted on the slide, rams the round into the breech.

Oscillating Assembly. The oscillating assembly is supported on, and pivots about, the trunnion supports and is made up of:

Breechblock. The breechblock is a vertical slide type containing the firing mechanism. The breechblock operating mechanism is mounted on top of the gun barrel housing. When the breechblock is closed, the firing circuit may be closed. The counter recoil action of the gun after firing activates the breechblock operating mechanism to open the breech.

Extractor. The empty case extractor mechanism, mounted on top of the gun barrel housing, has two extractor arms extending into extractor pockets in the breech face. When the breechblock rises (opening the breech), it actuates the extractor mechanism which kicks the empty case out of the breech and into the empty case tray.

Gas Ejector. After each firing, compressed air is discharged into the gun barrel to expel residual propellant gas remaining in the bore. The gas ejection system is activated by the breechblock at the end of the opening cycle.

Empty Case Tray. The empty case tray is a cylindrical tube pivoted at one side by an attachment to the slide. In the down position, it locks to the gun housing and recoils on a splined shaft driven by the empty case tray drive. The tray receives the empty case extracted from the breech and raises to align the empty case tray with the empty case ejector.

Empty Case Ejector. The empty case ejector is a tube mounted on top of the slide, along with an associated chain track assembly, which expels empty cases from the mount. The chain and attached pawl operate when an expended case in the empty case in the empty case tray is in alignment with the tube.

Recoil. Firing the gun causes recoil action in which the gun barrel housing slides backward in the slide on the keys supporting the housing. Recoil cylinders, machined in the gun barrel housing, control the deceleration of the recoiling components.

Counterrecoil. Two counterrecoil cylinders are mounted on the inboard sides of the slide walls in back of the gun barrel housing. They are nitrogen charged cylinders that help decelerate recoil. They also return and hold the gun in battery until the next firing.

Gun Barrel. The gun barrel fits into the gun barrel housing, and is secured by four segments of interrupted threads and a barrel locking key. The barrel is a two piece unit – a tube and a liner.

Gun Mount Control. The appropriate control mode of the gun mount is selected through switching at the control panel. Gun mount control is the combined control of the gun loading system and the gun laying (train and elevation) system to position the gun, and to load the breech with ammunition. The gun loading system may be controlled in automatic or step; the train and elevation systems in remote or local.

Automatic Control. Automatic control is the normal mode for the gun loading system. In this mode, the components of the gun loading system operate automatically in a synchronized sequence, and load orders initiate the operation of the gun's loading system.

Step Control. Step control is used during maintenance or testing, or if automatic control is inoperative. In step control, individual components of the gun loading system are operated by switches on the EP-2 control panel.

Remote Control. The train and elevation systems can be operated in remote control. In this mode, the mount is automatically positioned by gun orders generated by the fire control system or at NWL by dummy directors.

Local Control. In this mode the operation of the train and elevation systems are controlled from the EP-3 test panel for testing, checking and emergency purposes.

Control Panels. The control panels in the system are:

The Power Panel (EP-1), Figure 4 of Appendix A, contains circuit breakers and rotary switches used by the gun captain to distribute power to the gun mount motors, control circuits, and indicator light circuits.

The Control Panel (EP-2), Figure 5 of Appendix A, is the control panel for the gun mount. This panel has the electrical equipment for selecting, controlling and monitoring all phases of gun mount activity. Firing can be initiated at EP-2 by closing a firing key on the panel.

The Test Panel (EP-3), Figure 6 of Appendix A, is used to test and check the train and elevation systems. Test equipment can be plugged into the panel for checking the gun laying system and an operator can train and elevate the gun using the local control station at EP-3 panel.

Electrical Power. 440 volt, 60 Hertz, three-phase power is the main supply powering the train and elevation systems, the main and auxiliary loading system motors, the anti-icing and the ventilation systems. Also, the 440 volt power is transformed in the EP-1 panel to 115 volt, 60 Hertz, single phase power for the lighting, alarms, direct current conversion, power contactors, firing circuit relays, and the train and elevation test circuits synchros. A 115 volt, 400 Hertz, single-phase power line supplies the train and elevation synchros and the electronic servo control units. A separate 115 volt, 60 Hertz, single phase source is used for the firing circuit transformer, but a DC source is used instead of the transformer at NWL.

Auxiliary Equipment. The auxiliary equipment of the mount includes:

Ventilation System. The ventilation system expels hot air from the gun house through the base ring into the loader room. A heat exchanger is built into the ventilation system to cool hydraulic fluid of the upper system.

Cable Reel. The cable reel assembly is composed of two grooved reels – one at the stationary center section of the loader drum and one suspended from the carriage – that feed power supply lines from the ship into the rotating structure. The power supply lines (electric and pneumatic) are anchored at the carriage to provide sufficient slack and to prevent tangling.

Anti-Icing System. An anti-icing system to ensure normal operating of the mount under freezing weather conditions is provided. The base ring water shield, the gun port shield and the empty case ejector door are anti-iced. The system consists of a fluid heating and supply tank, fluid circulating motor pump, and a piping system. The system is charged with an ethyleneglycol-water mixture.

Ammunition Strikedown System. A strikedown hoist is installed in the NWL mount outboard of the loader drum. Carts for placing cartridges and projectiles on the hoist pawl were provided. (See Figures 7 and 8 of Appendix A.) This system is not representative of planned shipboard installations.

C. Installation

The general arrangement of the mount as installed at NWL can be seen in Figure 9 of Appendix A. The mount is operated from the control shelter located directly aft of the mount. A 5"/54 Caliber MARK 42 MOD 4 Mount is installed at the left of the 8"/55 mount, and a 5"/54 Caliber MARK 45 MOD 0 Mount is at the extreme left. The van trailers in the lower left house radar instrumentation and blast measuring equipment. Figure 10 of Appendix A shows the mount during installation of the oscillating assembly after conversion to 8-inch. The view is from the port side and the elevation power drive can be seen in the lower part of the picture. Figure 11 of Appendix A shows the mount installation from the front after decking and a water tank used to collect cases during firing have been installed. An X-band doppler radar can be seen at the left of the mount. An overall view showing the loading of charges and projectiles is given by Figure 12 of Appendix A, and Figure 13 of Appendix A is a view of the mount firing.

III. DESCRIPTION OF TEST EQUIPMENT

A. Train and Elevation Power Drive Tests

Power drive tests were conducted using the following equipment supplied with the mount:

Limiter and demodulator model G 2120897
Order signal generator 2626237
Recorder MARK 220 2860047

B. Loading System Tests

Event cycle times were obtained using the following equipment supplied with the mount:

Limiter and demodulator model G 2120897
Recorder MARK 220 2860047
Tachometer and synchro assembly LM 2626222
Connecting test cable T14159
Oscillograph hookup cable 2626238
Timer M6X3 on the inside of the back door of the EP-2 panel

Times were recorded on the recorder by positioning the timer to the function being performed by the mount (such as cradle raise) and measuring time between pips (indications of switch actuations) on the record. A back-up time was obtained from the timer reading. Position vs time, velocity vs time and acceleration vs time data were obtained from the recorder traces, with the tachometer and synchro assembly providing the input. Brackets and gearing are included on the mount at several locations for mounting the assembly. Procedures are given in the Maintenance Requirement Cards (MR cards) and calibrations were provided by NOD/fmc.

C. Electrical Power Consumption Tests

Power consumption was measured using the following equipment:

Halltron power computer model PC-2K4-3 including two model CT 2000L current transformers for measuring the 440-volt, 3 phase power.

Halltron power computer model PC-51 (400 Hz, 115 VAC) for measuring the 110-volt, 400 Hz, single phase power.

Newport model 60 differential amplifier with low pass filter

Sangamo Electric Co. Model 3600 14 channel tape recorder with wide band group II electronics.

Incor galvonometer driving amplifier.

Honeywell model 1508 24 channel oscillograph with model N-3300 galvonometer.

Portable cassette audio recorder.

The power computers were supplied by Ohio Semitronics, Inc. of Columbus, Ohio. They are precalibrated devices utilizing the "Hall Effect" in a multiplier circuit to obtain the true product of voltage and current in an AC circuit. The output is VDC proportional to the true power consummed by the load ($EI \cos \theta$). The power computer transformers were placed on the power lines supplying the EP-1 panel. The tape recorder provided a record of real power consummed, and an oscillograph was used for reproduction.

D. Firing Tests

All chamber pressures taken during firing were obtained using 1/30 in^2 area copper crusher disks in NWL Type D gauges. The disk lots were calibrated against measurements taken with piezoelectric gauges in 5"/54 gun firings.

Velocities were obtained using a chronograph with coils suspended in front of the gun with the projectiles magnetized, an X-band doppler radar system and/or a C-band doppler radar system. X-band doppler data were considered the primary system.

Equipment used with the coil velocity system was:

Coils (fabricated at NWL)
AUL Instrument Co. Model 1000 shaping adapter
Naniloa Model 282 time interval counter
Sangamo Electric Co. Model 4700 14 channel tape recorder

The counter was used for immediate read-out while the tape recorder gave a permanent record of flight time between coils.

Equipment used with doppler systems was:

X-Band Radar of special manufacture
C-Band Radar of special manufacture
Wave Tech model 112 frequency oscillator
Sangamo Electric Co. Model 3500 tape recorder
General Radio variable filter
Electrac model 215T filter
Hewlett Packard model 5248 frequency meter
Shaping amplifier (NWL fabricated)
3 Darcey model 361 A-R doppler counters
50 ms shaper (NWL fabricated)
Tektronics model 184 timer mark generator
Storage register (NWL fabricated)
Franklin model 3200 digital printer
Honeywell model 1508 direct print oscillograph
Newport model 60 data amplifier
Endevco model 4401 conditioning unit

Figure 14 of Appendix A is a schematic giving the arrangement of this equipment. All of this doppler equipment was located in a van in the foreground of Figure 9 of Appendix A except for the radars which were positioned to the right of the mount (X-band) and to the left-rear of the mount (C-band). Figure 15 of Appendix A shows the C-band radar in position.

Intensity of muzzle flash was measured using:

EG&G photodiode model SGD-444
Wide band-pass optical filter 1L/WB-510
Newport model 60 data amplifier
CEC oscillograph model 5-133 with a 7-362 galvanometer

The output of the detector is amplified and matched to the galvanometer in the oscillograph recorder through the amplifier.

Ranges of falls of shot were obtained by observers manning four range stations along the Virginia river shore, each provided with a theodolite to obtain the sight angle of the splash. The gun and the station are at known locations and the theodolites were referenced on known landmarks. A computer program was designed to select the median of the intersections of lines of sight from each station as the fall of shot and, given the gun train, to compute the range and drift from the line of fire. Meteorological data was obtained on the surface using local equipment and

at altitude from the Naval Air Station, Patuxent River. A Beukers system at NWL provided back-up data. Knowing gun trunnion height, tide level, and meteorological conditions, range table ranges could be computed using NAVORD OP 1041 and OP 1333. These ranging methods and computations were in accordance with current general NWL procedures.

Mount data was obtained using the following transducers:

Recoil pressure - Dynisco PT-81A, 5000 psi strain gauge – bridge type pressure transducer

Counterrecoil pressure – Dynisco PT-81A, 3000 psi

Strain measurements – Miro-Measurements type EA-06-250BF-350W single arm strain gauges.

Recoil displacements – NWL fabricated rack and pinion assembly driving a 10-turn potentiometer (Spectral model 510).

Small displacements of liner and breechblock with respect to the housing – Bournes Linipot model 2001416014-.44 (2000 ohms at .44 inches full displacement)

Timing – Tektronix time mark generator Model 184.

Transducer signals were applied to Endevco model 4470 signal conditioning units with appropriate plug-in mode cards and Newport Model 60 data amplifiers. All data were recorded on magnetic tape (Sangamo model 4700 or 3600 recorder) and reproduced on a Honeywell model 1508 oscillogram using M-3300 galvonometers.

E. Gun Jump Test

An attempt was made to study gun jump using three Mitchell 35mm cameras and an horizontal and vertical scale attached to a velocity coil.

F. Cook-Off Test

An empty projectile was instrumented with iron constantan thermocouples with the leads fed through a pipe fitted to the base plug. An empty case with a brass plug with a hole for the pipe was used for loading and ramming the projectile. Thermocouple outputs were recorded on a Honeywell model 153X62P16-X-SONG recorder.

G. Gun Blast Test

Gun blast pressure measurements were made using the following equipment:

Crystal Research Inc. piezoelectric pressure transducers
Endevco charge amplifiers
Honeywell model 1612 direct print oscillograph
Sangamo model 3500 tape recorder
Tektronix model 184 time mark generator

The transducer output was amplified and recorded with the timing pulser on both the oscillograph, for direct readout, and the tape recorder for the final record.

H. Smoke and Fumes Test

Equipment used in detecting toxic gases in the mount was:

American Instrument Co. 100cc/min peristaltic pumps
Mine Safety Appliances Co. (MSA) hand operated grab samplers
MSA carbon monoxide colorimeter indicator tubes (0-1000 ppm range)
Kitagawa Co. carbon monoxide length of stain indicator tubes (0-3000 ppm range)
MSA Monitaire portable sampler (for lead detection)
MSA Lira model 300 dual beam infrared carbon monoxide analyzer
Newport model 60 data amplifiers
Sangamo Electric Co. Model 4700 or 3600 tape recorder
Honeywell model 1508 oscillograph using galvonometer M-3300

Sampling via the indicator tubes was governed by a sequence timer and solenoid valve arrangement. The continuous infrared analyzer output was amplified and recorded on the tape recorder. Recorded data was then reproduced on an oscillograph.

IV. TEST PROCEDURE

A. Train and Elevation Power Drive Tests

Train and elevation power drive tests were conducted using the order signal generator as the remote order source and the test panel (EP-3) as the local order source (shown in Figure 16 of Appendix A). Most testing was done in remote control. The limiter-demodulator and the double channel recorder were used to record error (difference between the B-end drive position and the ordered position) vs time, velocity vs time, or position vs time. The order signal generator provided the order signals to the stators of the 1X and 36X control transformer synchros in the (train or elevation) receiver-regulator.

Error Trace. B-end response error trace voltage was obtained from the 36X test control transformer synchro in the receiver-regulator. The rotor of this synchro is geared to the B-end response. The stators were electrically connected to the 36X control transmitter synchro stator in the EP-3 panel for local control, or to the order signal generator which electronically simulates the control transmitter synchro stator output in remote control. Rotor output voltage of this test synchro was applied through the test circuitry to the limiter-demodulator unit and then to the recorder.

Position Trace. B-end position trace voltage was obtained like the error trace voltage except that the test synchro stator was connected to a reference synchro which was kept in a fixed position. The order signal generator provided the order signal to the control transformer synchro stators, the 36X control transmitter synchro stator, and the test synchro rotor, mechanically linked to the B-end, provided the B-end position voltage to the limiter-demodulator and recorder.

Velocity Trace. B-end velocity trace voltage was obtained from the DC tachometer generator located in each receiver regulator. The tachometer generator is directly geared to the regulator B-end response gearing and furnishes a voltage proportional to B-end velocity. This voltage was applied through test circuitry to the limiter-demodulator and recorder.

Input Signals. The Order Signal Generator provided the several types of orders for the various power drive tests: static orders, constant velocity orders or SHM orders. Instantaneous switching from a static order to another static order was accomplished to obtain maximum accelerations, velocities and synchronizing times. Automatic switching where the operator switched from a static order to a constant velocity order at certain points enabled the mount to synchronize to a variable order with a known initial error.

B. Loading System Tests

Loading system cycle times were taken following detailed procedures given in MR card C-1. The tachometer-synchro assembly was coupled to the component cycled by attaching it to permanent brackets and gearing on the mount. Rate and position vs time records were taken, with appropriate ratios relating component movement to synchro rpm supplied by NOD/fmc. Switch action which initiated and terminated each cycle was superimposed as pips along the time axis. Traces with an empty mount were taken on 24 and 25 September 1971, and traces of cycles with a loaded drum, clips, cradle, and rammer were taken later at convenient times during the evaluation. Empty case ejector cycle times could not be obtained because of a bent mounting bracket for the tachometer-synchro assembly.

C. Ammunition Selectability

The ammunition selectability test was conducted by loading only one cell per clip (25 full charge rounds) since each clip can contain only one type of round. All round assignment switches were positioned at PD fuze and standard charge. Clip assignment switches were positioned as follows:

Clip	Cell Loaded	Type Assigned
1	1	1
2	2	1
3	3	1
4	2	2
5	2	5
6	3	2
7	1	6
8	1	2
9	2	2
10	3	2
11	1	3
12	1	3
13	3	3
14	1	3
15	3	4
16	1	4
17	2	4
18	3	4
19	2	3
20	1	1
21	1	5
22	3	6
23	1	6
24	2	6
25	3	6

The gun was to be fired in continuous load with the operator selecting the following in sequence:

Type Selected	Number of Rounds Fired	
2	5	
5	2	
1	4	
3	5	
6	5	
4	4	
	25	Rounds Total

The actual firing sequence was modified somewhat as explained in the Results and Discussion. (MARK 18 MOD 9 projectiles (obsolete) were used for this test to save on test costs.) The windshield of round ten broke, damaging the velocity coils and velocities were taken only for the first nine rounds. Other instrumentation for this test included recoil and counterrecoil pressures and durations, recoil displacement, ejection time and interval between rounds.

It should be noted that in order to accomplish this test, a minor wiring change had to be made in the EP-2 panel to eliminate the long round capability (since no long rounds were available during the evaluation). Normally types 1 and 3 are long rounds and the hoist would have to shift to the long flight to load.

D. Electrical Power Consumption

The 440 VAC - 60Hz power and the 110 VAC - 400Hz synchro power supplied to the EP-1 panel were monitored while various components of the mount were operated. Full mount operation with the anti-icing system heater and pump running was attempted but could not be accomplished because cold weather conditions were not severe enough.

E. Misfire Procedures

A check of misfire procedures, except for aspects covered by the safety analysis, consisted merely of checking the ability of the mount to unload a charge and to load a type 6 charge without a projectile. No attempt was made to use the misfire tray because of known deficiencies in the tray.

F. Regunning Procedures

Regunning was performed by removing the entire EX 28 MOD 0 liner and tube assembly, removing the liner from the tube on stationary supports on the ground, installing the EX 28 MOD 1 liner in the tube, and installing the assembly in the mount. This procedure was used in lieu of the standard procedure of replacing the liner with the tube still in the mount because of expected difficulty and potential damage in removing the liner, such as had occurred with 175mm assemblies of this design. On 20 April, after the Technical Evaluation, the EX 28 MOD 1 liner was removed from the tube in the mount, and then reinstalled. No serious problems or damage occurred.

G. Firing Tests

For most firing tests, the mount was instrumented for obtaining recoil pressure, counterrecoil pressure, and recoil displacement vs time data. Data were recorded on a common time base and referenced to the application of firing current for each round. Indications of projectile exit from the muzzle were provided by using strain gauges on the muzzle. For rapid fire programs, the recorders were run continuously so the time between applications of firing current could be obtained to get rate of fire.

All rounds fired with pressure gauges were fired in step load removing the empty powder cases by hand to prevent losing the gauges in the mount.

Powder case separation necessitated heat treatment of cases. All cases fired on and after 12 November 1971 were dipped in a sulphuric acid gun barrel decoppering solution for cleaning, and remaining dirt and corrosion were removed by hand prior to loading. All MARK 25 projectiles were loaded with cement to 260 lbs. Cartridges and projectiles fired on and after 12 November were wiped with a degreaser prior to loading in the mount.

H. Projectile Cook-Off

Attempts were made to check the possibility of a projectile cook-off in a hot gun by ramming an instrumented projectile as soon as possible after the last round was fired interfering as little as possible with other test requirements. After the last round of a test was fired the instrumented projectile and its cartridge case were loaded at the strikedown hoist into the drum, run through the loading system and rammed. The case was removed by hand and the thermocouple leads connected. The location of the thermocouples in the projectile were as follows:

1/2-inch aft of the nose plug on the projectile inner wall.

14 inches forward of the projectile base on the projectile inner wall.

1/2-inch forward of the front of the base plug on the projectile inner wall.

Imbedded in the rotating band at the maximum diameter.

Imbedded in the rotating band at the maximum diameter diametrically opposite the above thermocouple.

On the front of the base plug.

I. Reduced Charge

A reduced charge round of 67.00 lbs. of NACO propellant, SPCF 11073 was used early in the testing of the 8"/55 MCLGM. This charge was estimated based on testing conducted in an 8"/51 barrel in a test girder to give the desired reduced charge velocity of 2220 ft/sec. This charge was revised to 66.07 lbs. based on results of probing rounds fired from the EX 28 MOD 1 liner on 4 November and was used during the OPEVAL.

J. Gun Blast

Initial blast pressure measurements were made during three series of five single full charge rounds fired on 4, 6 and 7 October 1971. Twelve blast pressure transducers were arranged at various positions in the horizontal plane of the gun muzzle as shown in Figure 17 of Appendix A. The transducers were placed edge-on to the shock front in a horizontal attitude. Figures 18 and 19 of Appendix A show the gauges arranged in front of the mount.

Additional testing was done during the rapid fire test of 12 November using one piezoelectric transducer positioned in the horizontal plane, 17 feet from the gun muzzle along a radial line 60° from the bore axis. The transducer was in a plane with the gun if it would have been at 0°30′ elevation. The test was fired at 10° elevation. During the firing of 13 December 1971 (actually during the OPEVAL test), two piezoelectric transducers were used. One was located 30 feet from the muzzle along a radial line 150° from the bore axis and the other was at 20 feet on a 90° radial. Both again were in a horizontal, gun bore-axis plane with the gun at 0°30′ elevation. The firings were conducted at 20° elevation. The first transducer was about 11 feet below the horizontal, bore-axis plane and the second was about 8 feet below.

K. Smoke and Fumes

Smoke and fumes were monitored during testing on 12, 22, 23 and 30 November and 3 and 13 December 1971. Visual observations were used as a basis for qualitative observations on smoke buildup, and the infrared analyzer allowed continuous monitoring for carbon monoxide. The colorimetric indicator tubes were also used in conjunction with pumps and solenoid valves operated periodically by timers during firings to measure carbon monoxide concentrations at locations other than those monitored by the infrared analyzer. For the tests of 12, 22 and 23 November, the analyzer sampling tube was located above the deck on top of the loader drum at the rear of the mount under the left trunnion support. For the tests on and after 30 November, the tube was located at the top of the shield over the breech. Extensive amounts of air from above the loader drum were also drawn through two MSA "Monitaire" units to detect the presence of lead. Additionally, NOS, Indian Head personnel circulated large quantities of gas from the breech area through a Dewar apparatus cooled by liquid nitrogen to observe directly for the presence of any oxides of nitrogen. NOS, Indian Head personnel also obtained gas samples from the same area for subsequent detailed laboratory analysis of all possible toxic constituents.

During all firings, the ventilation system was operating and all doors were closed. Doors were opened when stoppages occurred due to mount casualties and after completion of the firings.

L. Anti-Icing System

The anti-icing system test was conducted on 8 February 1972 between 0500 and 0900 hours EST when the ambient temperature ranged between 16° and 18°F. The mount was sprayed periodically with water around the gun port shield and water seal. The mount was checked for operability in train and elevation and anti-icing fluid temperature was recorded every half-hour.

V. RESULTS AND DISCUSSION

A. Train and Elevation Power Drive Tests

Train and elevation drive tests were accomplished 20-22 October 1971. No problems were encountered except that with the dither pot, described in Appendix B, which was temporarily repaired on 21 October and permenantly repaired on 23 October. Results of these tests are presented in Appendices D and E. All data in Tables D-1 of Appendix D and E-1 of Appendix E indicate performance meets or exceeds the requirements of Reference 7 and is satisfactory. The recorder trace of each test is included in Appendices D and E for reference and record purposes.

B. Ammunition Loading System

Loading system tests were conducted on 24-25 September 1971, except that empty case ejector traces could not be taken because a bracket for mounting the tachometer-synchro assembly was bent in shipment or during installation of the slide after conversion. Results are presented in Table F-1 of Appendix F. The recorder traces are also included in Figures 1 through 24.

C. Ammunition Selectability

Rounds were loaded for the selectability test in the morning of 27 September 1971, and fired that afternoon. Test results are tabulated in Appendix G (ballistic results) and Table 3 (actual firing order used). A problem with the cradle loaded indications caused by photocell sensitivity caused a stoppage after round 11 (a problem listed in Appendix B). Bulbs were replaced and voltages were adjusted, rendering the mount operable again. The test was resumed, skipping the first Type 3 round which was in clip 11 (round 12 of the firing order specified in the procedure). This round was picked up, then, as the last Type 3 round (round 16).

It can be determined from Table 3 that for each clip the drum indexes, approximately 2.3 seconds are added to the interval between rounds. The longest interval between rounds was 43.0 seconds between rounds 15 and 16 when the drum had to index from clip 19 to clip 11.

Because the mount fired only those rounds selected by the operator and functioned as designed and described in OP 4116, results of this test are deemed to be satisfactory.

TABLE 3

FIRING ORDER FOR SELECTABILITY TEST OF 9-27-71

Round No.	Round Type	Clip No.	Cell No.	Required Indexing (No. of Clips)	Required Cell Transfers	Time Between Rounds (sec)
1	2	4	2	0	Rd in Breech at T-0	T-0
2	2	6	3	0	Rd in hoist at T-0	4.8
3	2	8	1	2	HT, TH	6.1
4	2	9	2	1	2H, 3H, HT, TH, 2H	7.4
5	2	10	3	1	3H, HT, TH, 2H, 3H	7.4
6	5	21	1	11	HT, TH	28.2
7	5	5	2	9	2H, 3H, HT, TH, 2H	26.1
8	1	20	1	15	3H, HT, TH	38.1
9	1	1	1	6	2H, 3H, HT, TH	18.3
10	1	2	1	1	2H, 3H, HT, TH	7.5
11	1	3	3	1	2H, 3H, HT, TH, 2H, 3H	7.3
			Stoppage due to casualty	----------	----------	----------
12	3	12	1	0	Rd in breech at T-0	T-0
13	3	13	3	0	Rd in hoist at T-0	4.8
14	3	14	1	1	HT, TH	5.2
15	3	19	2	5	2H, 3H, HT, TH, 2H	16.6
16	3	11	1	17	3H, HT, TH	43.0
17	6	22	3	11	2H, 3H, HT, TH, 2H, 3H	31.4
18	6	23	1	1	HT, TH	5.1
19	6	24	2	1	2H, 3H, TH, HT, 2H	7.3
20	6	25	3	1	3H, TH, HT, 2H, 3H	7.2
21	6	7	1	7	HT, TH	18.8
22	4	15	3	8	2H, 3H, HT, TH, 2H, 3H	24.5
23	4	16	1	1	HT, TH	5.1
24	4	17	2	1	2H, 3H, HT, TH, 2H	7.4
25	4	18	3	1	3H, HT, TH, 2H, 3H	7.2

H Hoist position.
T Transfer position
HT Clip transferred from Cell 3 at Hoist position to Transfer position.
TH Clip transferred from the Transfer position to the Cell 1 at the Hoist position.
2H Clip transferred from the Cell 1 at Hoist to Cell 2 at Hoist.
3H Clip transferred from Cell 2 at Hoist to Cell 3 at Hoist.

D. Electrical Power Consumption

Electrical power tests were conducted on 14 and 17 January 1972 after completion of the OPEVAL. The test could not be conducted prior to the OPEVAL because of transducer procurement lead time. Results of the tests are in Appendix H, with measurements listed in Table H-1. Reproductions of the power vs time analog data for each test are included as Figures 1 through 12 of Appendix H. Probably the most significant result is the peak true power demand of the mount of 637 kw, 599 kw peak without the anti-icing system and 38 kw for the anti-icing system. Theoretical peak running load power was computed to be 679 kw.

E. Misfire Procedures

Misfires occurred during the TECHEVAL due to primer blowback and were purposely caused during the OPEVAL by loading empty charges. Procedure 1 of OP 4116 specifies remote unloading and ejecting the charge and loading of a Type 6 clearing charge. Procedure 2 specifies unloading the charge out the rear of the mount using a misfire tray. Procedure 1 was generally adequate. Procedure 2 could not be checked because of the non-availability of an adequate misfire tray. Reference 8, the safety analysis report and Reference 6, the OPEVAL report treat this subject in more detail.

F. Regunning Procedures

Regunning was performed once during the technical evaluation when the liner for the EX 28 MOD 0 gun barrel assembly was replaced with that of the EX 28 MOD 1 assembly on 9 October 1971. After the operational evaluation, during the weeks of 17 and 24 April 1972, the liner for the EX 28 MOD 1 was removed and reinstalled, the EX 28 MOD 1 barrel assembly was removed, the EX 30 MOD 0 assembly was installed, and the liner for this barrel assembly was removed and reinstalled. Also, during the week of 8 May 1972, the EX 30 MOD 0 barrel assembly was removed and the EX 28 MOD 1 was installed. On 31 May, the liner for the EX 28 MOD 1 was removed and the liner for the EX 28 MOD 0 (after modification for a larger chamber) was installed.

In all cases, the liner was removed from the tube without excessive force. Dow Corning Molycote Type G lubricant was used, and seizing and scoring such as occurred with the 175mm liner did not occur. A wooden platform was constructed to give working space for men working at the barrel, icebreaker and bushing.

Raising the breechblock for access to the upper key for liner removal involves using a chain hoist without much overhead clearance, and may involve some trial and error until personnel become experienced.

Upon the last regunning (liner replacement), a five-man weight handling crew and a two-man gun crew performed the entire operation (excluding gathering of tools, etc.) in two hours and thirty-seven minutes. Several errors were made in the operation, and, especially if another man was added to the gun crew, this time could be reduced to less than two hours. Regunning by replacement of the liner-tube assembly was accomplished by the same number of people in about six hours. Differences in the two regunning procedures require that the slide be backed out of battery and the bushing and icebreaker removed to replace the liner-tube assembly. These operations are not required to replace the liner only, but the breechblock must be hoisted up to gain access to the upper liner locking key. Actual crane time to remove the liner or liner-tube assembly is the same.

G. Proof Tests

Proof testing was conducted with the EX 28 MOD 0 liner on 3 September 1971 and with the EX 28 MOD 1 liner on 13 October 1971. Because of limitations on the recoil system of this prototype mount, proof rounds were not fired at elevations higher than 10°. No damage was incurred by the mount, and instrumentation measurements are included in the tables of Appendix G.

H. Cartridge Assembly

It was decided to test the mount using MARK 25 260 lb projectiles and full charges which would produce a nominal muzzle velocity of about 2700 f/s with an upper service pressure limit of 56 ksi (or 20.8 tsi(Cu)) using flashless NACO propellant. A reduced charge to give 2220 f/s was also decided upon. The charge determination work is reported in References 9 and 10. Cases used were the EX 1 MOD 1 cases for the 175mm. All charge assemblies were not optimized for this evaluation but used off the shelf components to save time and money.

Partial case separation occurred in early 8"0 firings with service and proof charges. Failures of a similar nature had also occurred in 175mm firings. It was found that after heat treating, the cases did not separate at service pressure, hence, only heat-treated cases were used for full charge firings in rapid fire. Since cases were softer after heat treating, they had a tendency to deform. In some instances at proof pressure, cases ruptured at the extractor pockets and expanded into the head space jamming the breech closed.

A problem was encountered during rapid fire in that an occasional round would fail to ram fully. In some cases, this was due to pieces of plug jamming between the case and the chamber. At first, plugs with a very small radius at the leading edge were used and these would clip when sliding over the liner breech face

upon ramming. Plugs of a later design increased this radius and another spring was added under the cradle restrainer to solve this problem. All plugs were gauged as well. On 9 December 1971 a fire-out was attempted but a gun stoppage occurred after round 19 because the case failed to extract. An accumulation of fine soot was noticed in the chamber which had built up from firing heat-treated cases which had a dirty scale on the exterior surface. All cases were then cleaned by dipping in acid, rubbing dirty spots with emory cloth, and degreasing. All projectiles were wiped off with rags dampened with degreaser. All ammunition thus treated extracted satisfactorily.

Several stoppages were caused by primer blowback around the ignition element with both the MARK 37 MOD 2 and the MARK 38 MOD 2 primer used for full and reduced charges, respectively. Primer blowback caused residue around the firing pin, keeping the pin from protruding from the breech block and contacting the primer of the next round.

The propellant used during the TECHEVAL and OPEVAL was an 8"0 bag gun granulation, NACO formulation and was not especially designed for this gun. It should be noticed on Table G-1 of Appendix G that trunnion velocity uniformity was frequently undesireably high, and muzzle flash was frequent.

I. Rate of Fire

The rate of fire of the mount is highest, of course, when the same type of ammunition is fired from successive clips in continuous load. The data on Table G-1 of Appendix G indicate that the rate of fire is 11.7 rounds per minute at 0° elevation, increasing to 12.6 rounds per minute at 35° elevation, then decreasing to 12.0 rounds per minute at 60°. Rate of fire for firing in step control was about 3.5 rounds per minute, and the rates of fire for the selectability tests conducted during the TECHEVAL and OPEVAL were between 4 and 5 rounds per minute.

J. Gun Jump

It was decided not to conduct a test series designed explicitly to determine gun jump since gun jump is related to the ammunition characteristics and range tables as well as the mount. A small experiment was conducted, however, on 2 November 1971, the details and results of which are included in Appendix I.

K. Accuracy and Range Tables

Table 4 is an array of data taken from Table G-1 of Appendix G which shows accuracy of each shoot arranged by gun elevation. Acceptable accuracy is a corrected D/R of 0.70%, and from Table 4 it can be seen that on only one occasion out of fifteen for full charges was this exceeded. It was exceeded on two out of five for reduced charges, but one of these was at 60° elevation (the corrected D/R criteria of 0.70% can not be expected to apply at elevations above 45°). In four out of the twenty occasions (including the three where the corrected D/R was greater that 0.70%), the uncorrected D/R was less than the corrected D/R.

Agreement with the range table predictions was not good. Mean residuals, differences between corrected range and range table range, varied from −11 yds to 713 yds, showing considerable bias toward overshoot. Only one negative value out of 20 resulted.

L. Barrel Life

During the initial checkout, the Technical Evaluation, and the Operational Evaluation of the 8"0 MCLGM, 120 rounds were fired in the EX 28 MOD 0 liner and 473 rounds were fired in the EX 28 MOD 1 liner. Bore enlargement at the origin of bore was only 0.024 inch on the EX 28 MOD 0 barrel and 0.084 inch on the EX 28 MOD 1 barrel. The erosion gauge reading on the EX 28 MOD 1 was 2.75 inches

M. Velocity Loss

Mean velocities for the service charge with the EX 28 MOD 0 barrel ranged from 2784 f/s to 2708 f/s. Data from the six occasions for which mean velocities are available does not indicate a significant velocity loss slope.

Mean velocities for the service charge with the EX 28 MOD 1 liner are available from fifteen occasions when four or more rounds were fired, and range from 2711 f/s to 2674 f/s. Linear regression equations were fitted to the mean velocity vs bore enlargement at the origin data and to the mean velocity vs erosion gauge reading data. The equations are:

$$V = 2707 - 410.4\ (\Delta\ Do) \text{ with a standard deviation of } \pm 7.5 \text{ f/s}$$
$$V = 2673 - 5.489\ (BEGR) \text{ with a standard deviation of } \pm 9.2 \text{ f/s}$$

TABLE 4

8"/55 MAJOR CALIBER LIGHTWEIGHT GUN MOUNT MARK 71 MOD 0 RANGE ACCURACY DATA

Gun Elevation (degrees)	Range[1] Residual (yards)	Corrected Range Standard Deviation (yards)	Corrected D/R (%)	Date Fired (1971)
		FULL CHARGE		
8	153	59	.32	22 Nov
	92	107	.55	22 Nov
	-11	79	.48	30 Nov
10	79	166	.83	2 Nov
	97	83	.41	9 Nov
	8	83	.44	12 Nov
20	614	143	.51	4 Nov
	392	101	.36	13 Nov
	332	170	.59	13 Nov[2]
	312	148	.53	13 Nov[2]
27	543	116	.35	16 Nov
	580	106	.30	23 Nov
	563	135	.34	1 Dec
	713	131	.43	1 Dec
	541	169	.49	3 Dec
		REDUCED CHARGE		
35	100	105	.40	16 Dec
	114	71	.25	16 Dec
45	503	185	.56	3 Dec
	533	281	.93	3 Dec
60	610	224	.74	22 Dec

[1] Range Residual - The difference between the mean range corrected to range table conditions and the range table range. A negative value indicates an undershoot.

[2] These two groups were fired at 19° 30' elevation, but are included under 20° for purposes of this table.

where

V = velocity in f/s
Δ Do = bore enlargement at the origin in inches
BEGR = bore erosion gauge reading in inches

Mean velocities for the reduced charge with the EX 28 MOD 1 liner are available from five occasions and range from 2168 f/s to 2140 f/s. These data are insufficient to establish an approximate velocity loss slope.

N. Projectile Cook-Off Tests

A projectile instrumented with thermocouples was rammed and seated on three occasions:

1. After a 15-round rapid fire burst on 2 November. The projectile was rammed and the thermocouples were connected to the recorder seven minutes after firing the last round.

2. After 75 rounds rapid fire (4 bursts) on 12 November. The projectile was rammed and the thermocouples were connected nine minutes after firing the last round.

3. After 75 rounds on 13 December (during the OPEVAL) when the projectile was rammed and connected 20 minutes after firing.

Temperatures on the rotating band and on the inside of the projectile were highest on 12 November 1971. Temperatures at the base plug were higher than those at other locations in the projectile, reaching 178°F at 70 minutes after the last round was fired. Temperatures on the rotating band, at the base plug and near the nose plug vs time are plotted in Figure 20 of Appendix A for the round rammed on 12 November 1971.

It was noted that after firing the 75 rounds on 12 November, the barrel chamber was warm, but the hand could be placed against it indefinitely without real discomfort. The temperature on the outside of the barrel about three feet from the muzzle reached 504°F 30 seconds after the last round was fired, however.

O. Reduced Charge

The reduced charge was defined as a charge which would give a velocity of 2220 f/s using the MARK 25 projectile. Reduced charges were fired in rapid fire

on 13 and 14 September during the Technical Evaluation and firing data are tabulated in Appendix G. The mount operated satisfactorily on both occasions.

P. Safety Analysis

A safety analysis was conducted on the 8"0 MCLGM and is reported by Reference 8. No disqualifying safety problems were uncovered, although a number of improvements from a safety viewpoint are recommended.

Q. Blast Tests

Blast test data from the firings of 4, 6 and 7 October 1971 are tabulated in Table J-1 of Appendix J.

It was noticed by operating personnel and observers during various firings, however, that certain rounds had a seemingly greater shock and louder report than others; hence, the measurements of 12 November and 13 December. Since muzzle flash often accentuates blast effects, the purposes of these extra experiments were to examine differences between blast characteristics of flashing rounds and non-flashing rounds (none of the slow fire rounds fired on 4, 6 and 7 October flashed). Examination of the data taken on 12 November (only the data from the first 26 rounds were examined) indicated:

1. The average free-air peak pressure of the primary blast was 9.3 psi for the 8 rounds which flashed and 10.3 psi for the 18 non-flashing rounds.

2. All but one of the flashing rounds had a double peak, the time between peaks being about 0.4 milliseconds, and the average value of the second peak being 9.0 psi.

For the test of 13 December, the data from a sample of flashing and one non-flashing rounds from the 150°-30 feet transducer was played back over a longer time interval and examined:

1. There was no discernible difference in the free-air blast wave between flashing and non-flashing rounds (the average for the flashing rounds was 0.68 psi and that for the non-flashing was 0.65 psi).

2. A secondary shock was detected at between 65 and 85 milliseconds after the initial shock for the flashing rounds only, the secondary peak pressure being less than the primary peak and varying between 0.46 and 0.59 psi in value.

The double peak pressures occurring in flashing rounds is not significant because the peaks are too close together in time and there is no effective increase in peak pressure. The accentuated blast effects of flashing rounds could be explained by the delayed secondary blast noted in the test of 13 December.

R. Smoke and Fumes

The most significant carbon monoxide measurements were taken on 12 November and 13 December 1971 during 75-round firings. Carbon monoxide concentration versus time for these tests are shown in Figure 21 of Appendix A. Significant amounts of lead or oxides of nitrogen were not detected during any of the firings, but smoke would build up in the mount until the shield doors were opened A waiting period of about 15 minutes, depending on ambient wind conditions, was required to clear the mount.

In summary, the only toxic hazard detected in the mount is from carbon monoxide. Peak transient concentrations of 3000 parts per million (PPM) were detected in the gun house, cradle and loader drum areas. After firing, residual concentrations of above 1000 PPM were observed.

S. Anti-Icing System Test

Water was sprayed on the mount at intervals during 0500 to 0900 hours on 8 February 1972 when ambient temperatures ranged from 15° to 18°F. The mount operated satisfactorily in train and elevation when checked at half hour intervals. No ice formed on the gun port shield, the empty case ejector door or the base ring, whereas it did form on other parts of the shield as can be seen in Figures 22 and 23 of Appendix A. Anti-icing fluid temperature started at 42°F and rose to 62°F at 0530, 72°F at 0600, and stayed between 60°F and 76°F until 0900.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

It can be concluded from the test results that:

1. the train and elevation power drives respond satisfactorily to local or remote orders from dummy directors.

2. the loading system can sustain rates of fire between 11.7 and 12.6 rounds per minute in auto-load, can be cycled in step-load, and can select and load any of six types of ammunition which have been predesignated.

3. misfires can be extracted and ejected through the empty case door, and a clearing charge can be loaded and fired without a man entering the mount.

4. the mount can be regunned in less than two hours provided the crew is experienced and the facilities and effort are well coordinated.

5. mechanical performance of the cartridge case and the primer, and the ballistics and flash of the propellant are not generally satisfactory. Excessive headspace (static clearance between the base of the case and the breechblock), and linear motion and axial expansion between the barrel and housing under dynamic loads are contributors to the marginal performance of the cartridge case.

6. ballistic accuracy of the MARK 25 projectile fired from the mount is satisfactory, although the range tables for both the full and reduced charge are deficient and generally biased so that the projectile will fall longer than predicted (up to 3% longer). This bias is not unique with the 8"0 MCLGM, being related to the projectile and therefore noted in all 8"0 mounts.

7. barrel life and velocity loss results are not conclusive due to the limited barrel erosion, however, barrel life to about twenty percent expended is roughly comparable to that of the 8"0 barrel MARK 16 and acceptable when using NACO propellant.

8. some minor deficiencies from a safety viewpoint were uncovered, however none are inherent or disqualifying.

9. the gun blast profile for this gun is slightly less in magnitude than that for an 8"/55 caliber bag gun under the conditions tested.

10. smoke and carbon monoxide concentrations during firing make it unsafe to circulate the air in the mount to other spaces in a ship or to enter the mount for repairs until after the mount has been properly ventilated.

B. Problem Areas

There are several circumstances avoidable only at high cost or by schedule slippage which detracted from both the Technical and Operational Evaluations:

1. the prototype MCLGM was originally designed, built and evaluated as a 175mm mount and later converted to 8".0. Certain structural members in the loader drum area will require strengthening in production mounts and the oscillating assembly and carriage modified to accommodate increased projectile weights and firing loads.

2. the mount had been subjected to considerable testing as a 175mm prior to conversion to 8".0 (e.g., the loading system was subjected to a 50,000 cycle life test at NOD/fmc) and hence some parts were worn and fatigue failures were more likely to occur than in a new mount.

3. an extremely severe and arbitrary schedule prevented the contractor from completing all necessary work prior to commencement of the evaluation. No correspondence from the contractor was received indicating that the installation, conversion and his checkout were completed prior to the Technical Evaluation.

4. contractor personnel were required to operate the mount during some of the Technical Evaluation because local personnel had still not completed schooling on the mount.

5. problems were encountered throughout the Technical Evaluation with the cartridge assembly.

C. Modifications to Mount

It was concluded that the design of certain components of the mount which affected performance adversely during testing should be modified during the evaluation. Design modifications included were:

1. the photoelectric detectors were changed by installing light sources opposite the photocells and removing the reflectors.

2. the counterrecoil cylinder seals were redesigned.

3. a new, stronger cradle restrainer spring arrangement was installed.

D. Release to OPEVAL

Based on results of the Technical Evaluation, the performance of the 8"/55 Major Caliber Lightweight Gun Mount MARK 71 MOD 0 was judged to be acceptable and certification for release to OPEVAL was recommended on 12 November 1971 by Reference 11. The Operational Evaluation was begun under the auspices of COMOPTEVFOR on 15 November 1971.

E. Recommendations

The following recommendations are offered for the production mount design:

1. a fold-away platform is needed on the carriage for maintenance operations on the chamber, breechblock, and firing pin assembly and for access to barrel keys during regunning.

2. ladder rungs on the shield are needed and provision should be made for attachment of scaffolding for access to the bushing and icebreaker during regunning.

3. breechblock headspace and any clearances allowing aft movement of the breechblock with respect to the housing should be minimized.

4. a cartridge development program is needed to eliminate primer blow back, and muzzle flash; increase round-to-round velocity uniformity; and, to develop a reliable case, plug and crimp.

5. a time between rounds fired function should be included on the timer in the EP-2 panel, or provided in addition to it, to provide an overall check on the "health" of the loading system.

6. a new 8"0 range table is needed for both full and reduced charges for the MARK 25 projectile.

Additional recommendations from a safety viewpoint are provided in Reference 8.

REFERENCES

1. CNO Conf ltr OP344G/701E/pnl Ser 0255P70 to CNM of 26 Feb 1965, Subj: SOR No. 12-10

2. CNO Conf ltr OP723C/701E/ec Ser 0601P70 to CNM of 1 Oct 1969, Subj: SOR No. 12-10R1

3. NAVORD ORDTASK 553-111-090-1-U-1210330 of 22 Mar 1971, Subj: MCLGM 8″ Conversion

4. NAVORD Conf ltr ORD-5531/456:EJK Ser 03819 to CNO of 12 Aug 1971 Subj: Project Assignment Request for 8″/55 Caliber EX 71 MOD 0 Gun Mount

5. NWL Conf ltr TP:DLB/PJO:jca 8300 Ser 0720067 to NAVORD of 19 Jan 1972, Subj: 8″/55 MCLGM EX 71 MOD 0 Technical Evaluation; preliminary report of

6. COMOPTEVFOR Conf ltr 722:rg 3930 (0/S173) Ser 0122 to CNO and NAVORD of 20 Mar 1972, Subj: Final Report on Project 0/S 173, *"Conduct a Limited Scope Operational Evaluation of the 8″/55 MCLGM EX 71 MOD 0"*

7. NAVORD Specification XWS-4952

8. NWL ltr ESE:JSN:vdc 8000 to NAVORD (ORD-5531) of 5 May 1972, Subj: MARK 71 MOD 0 Eight-Inch Lightweight Gun System; safety evaluation of

9. NWL ltr TPB:JLM:pjc 8010/1-21 to NOSIH of 13 Jun 1972, Subj: 8-Inch Major Caliber Lightweight Gun (MCLG) Reduced Charge; establishment of

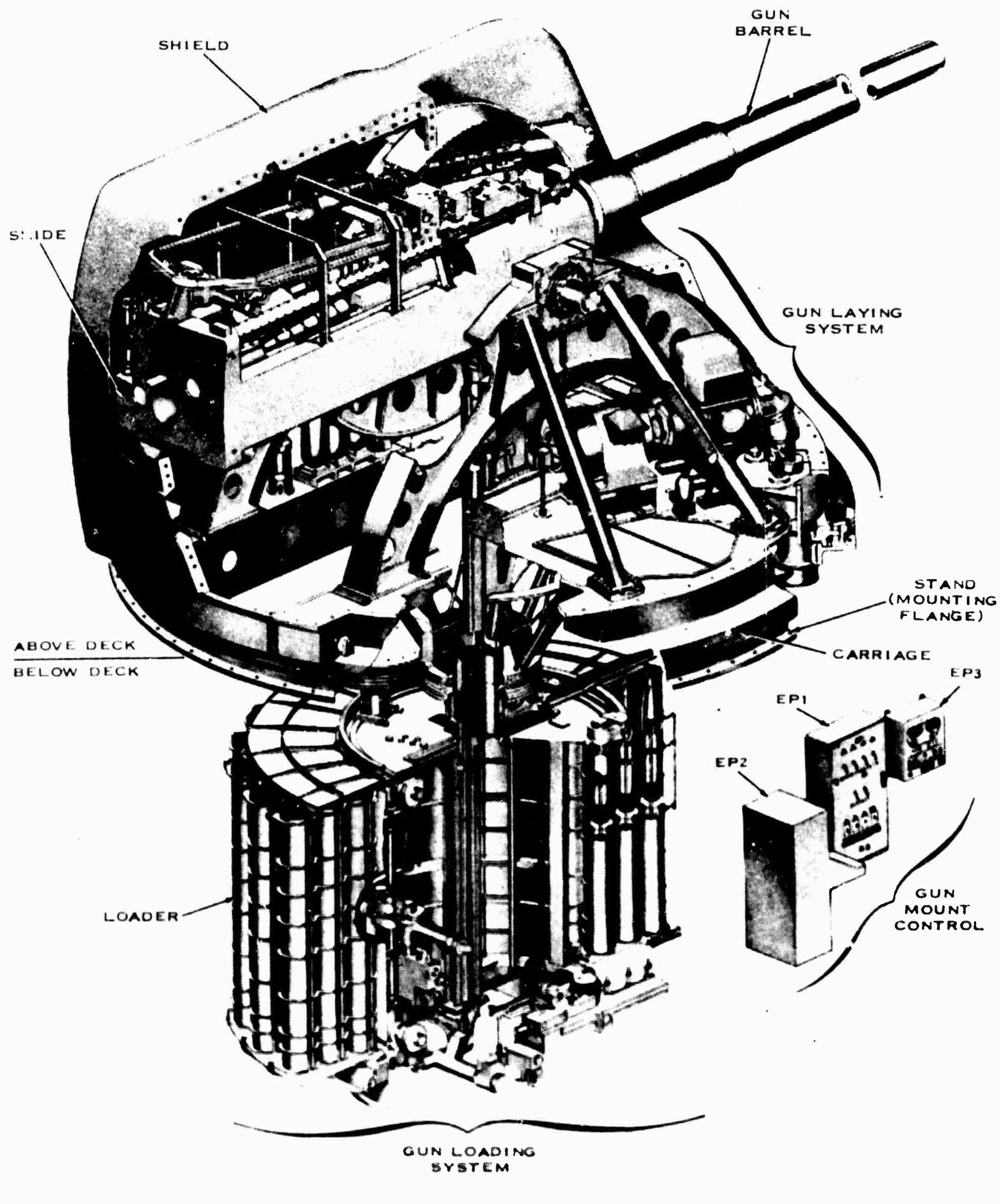
10. NWL ltr TPB:BZJ:scc 8010/1-21 to NOSIH of 22 Jun 1972, Subj: 8-Inch Major Caliber Lightweight Gun Propellant Evaluation; results of

11. NWL Conf msg 122230Z Nov 1971

12. NWL ltr FVE:MHP:ljb 10552 to NAVORD of 6 Jan 1972, Subj: Electromagnetic Susceptibility Test Plan for 8-Inch 55 Caliber Gun Mount MARK 71 MOD 0; report of

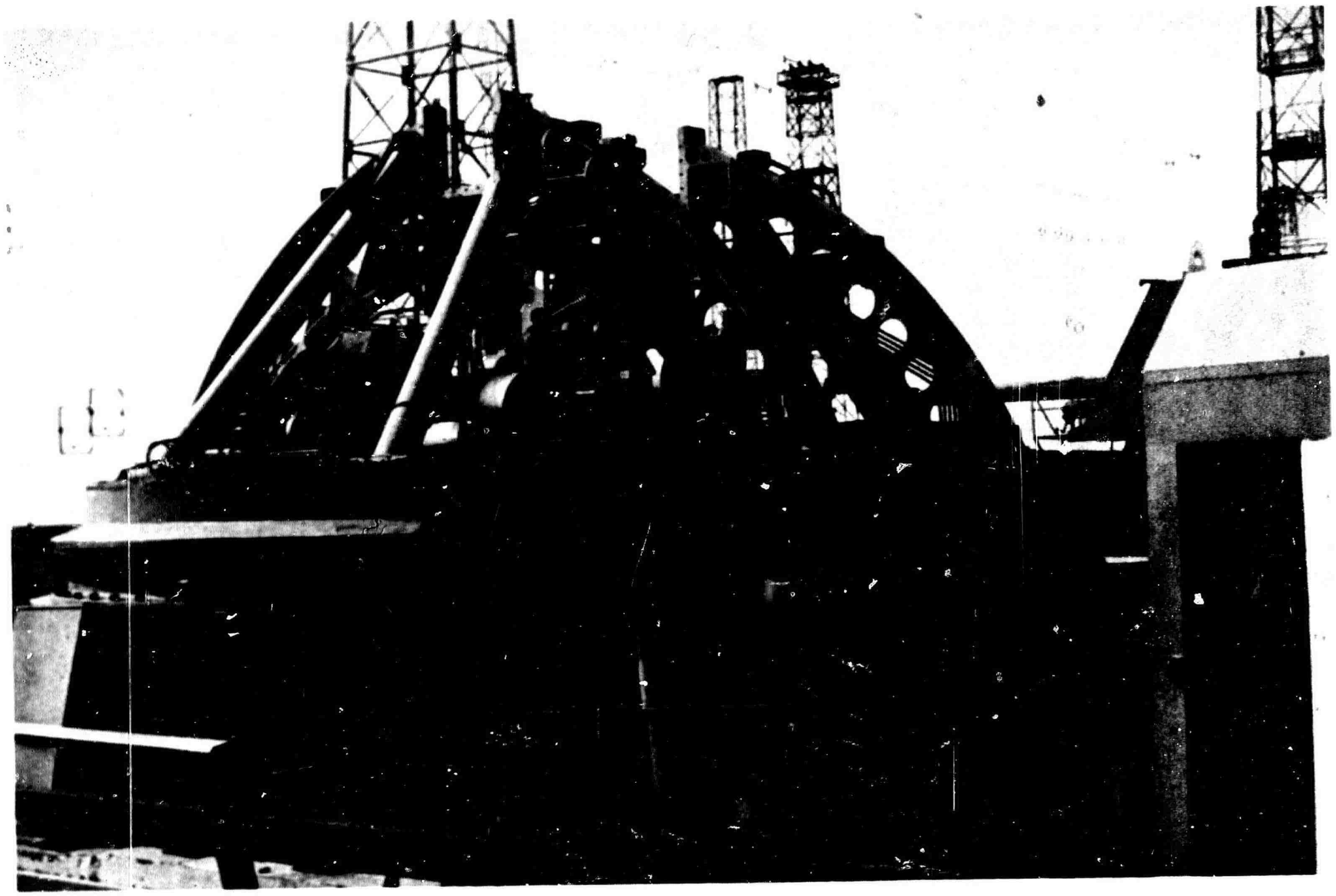
APPENDIX A

Figures 1 Through 23



PHD-2497-11-72 **FIGURE 1**

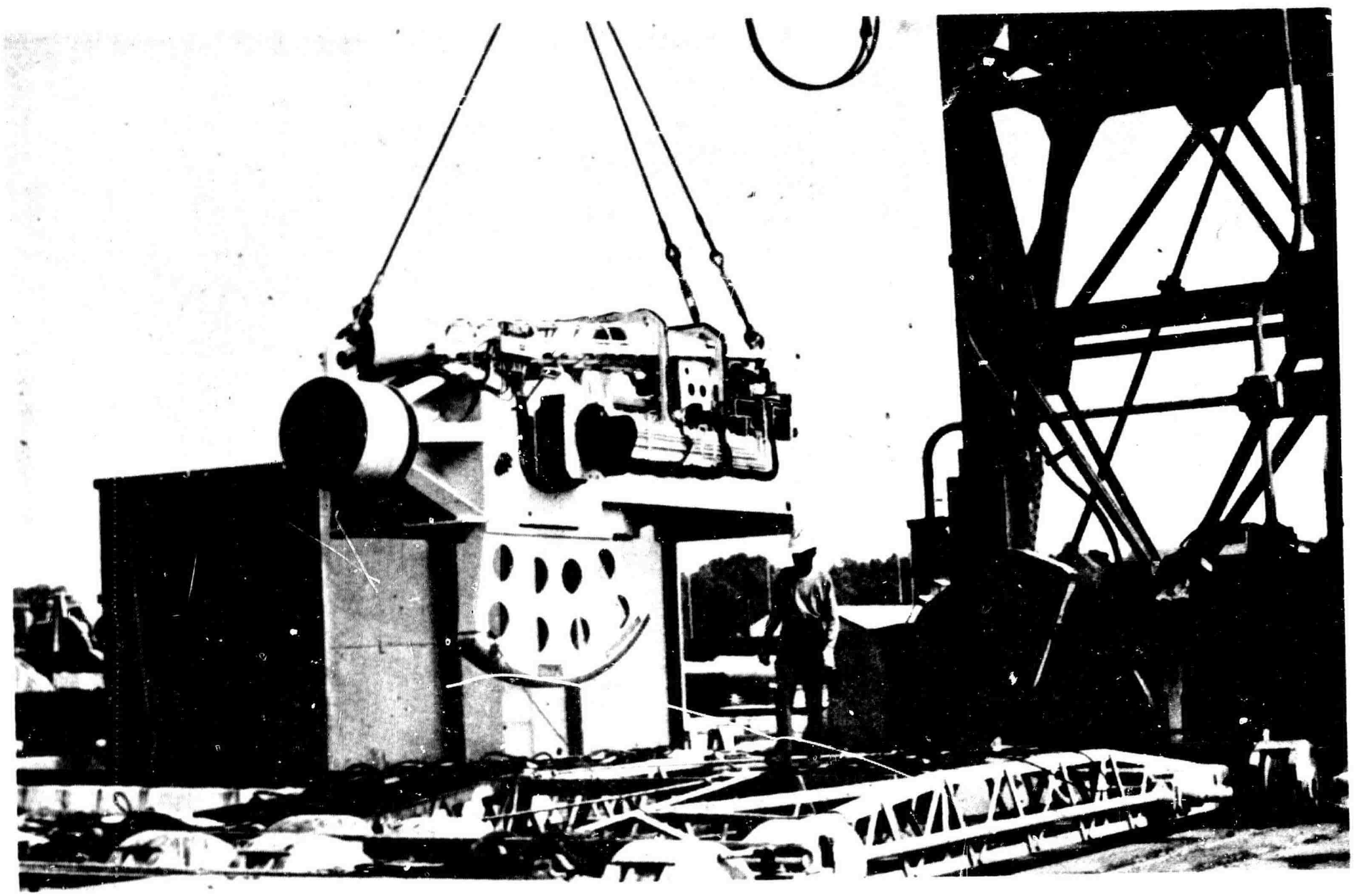
Cut-Away View of the
8"/55 Major Caliber Lightweight Gun Mount MARK 71 MOD 0



PHD-2498-11-72

FIGURE 2

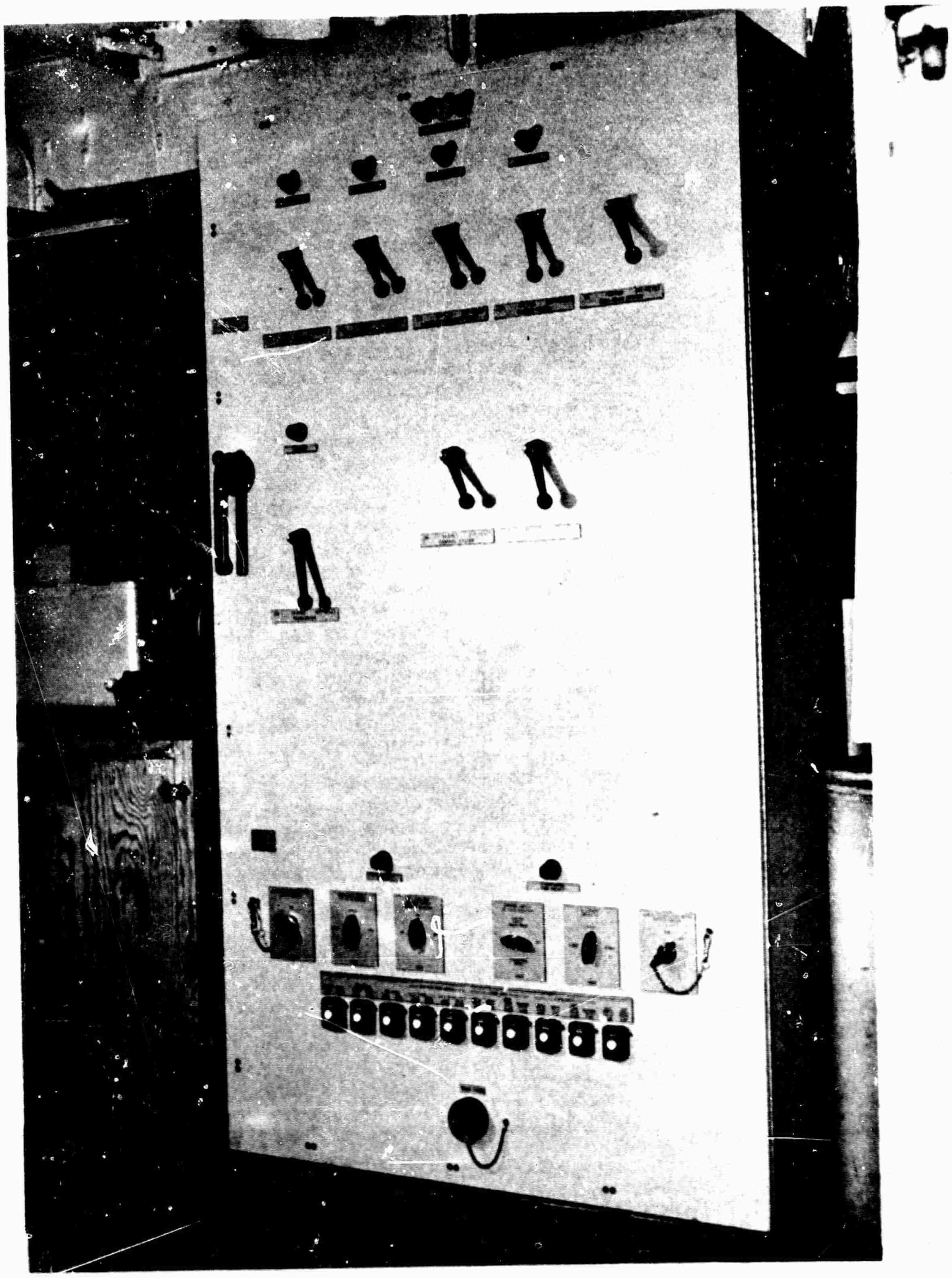
View of the Base Ring and Trunnion Supports of the
8"/55 MCLGM Installed at NWL



PHD 2499-11-72

FIGURE 3

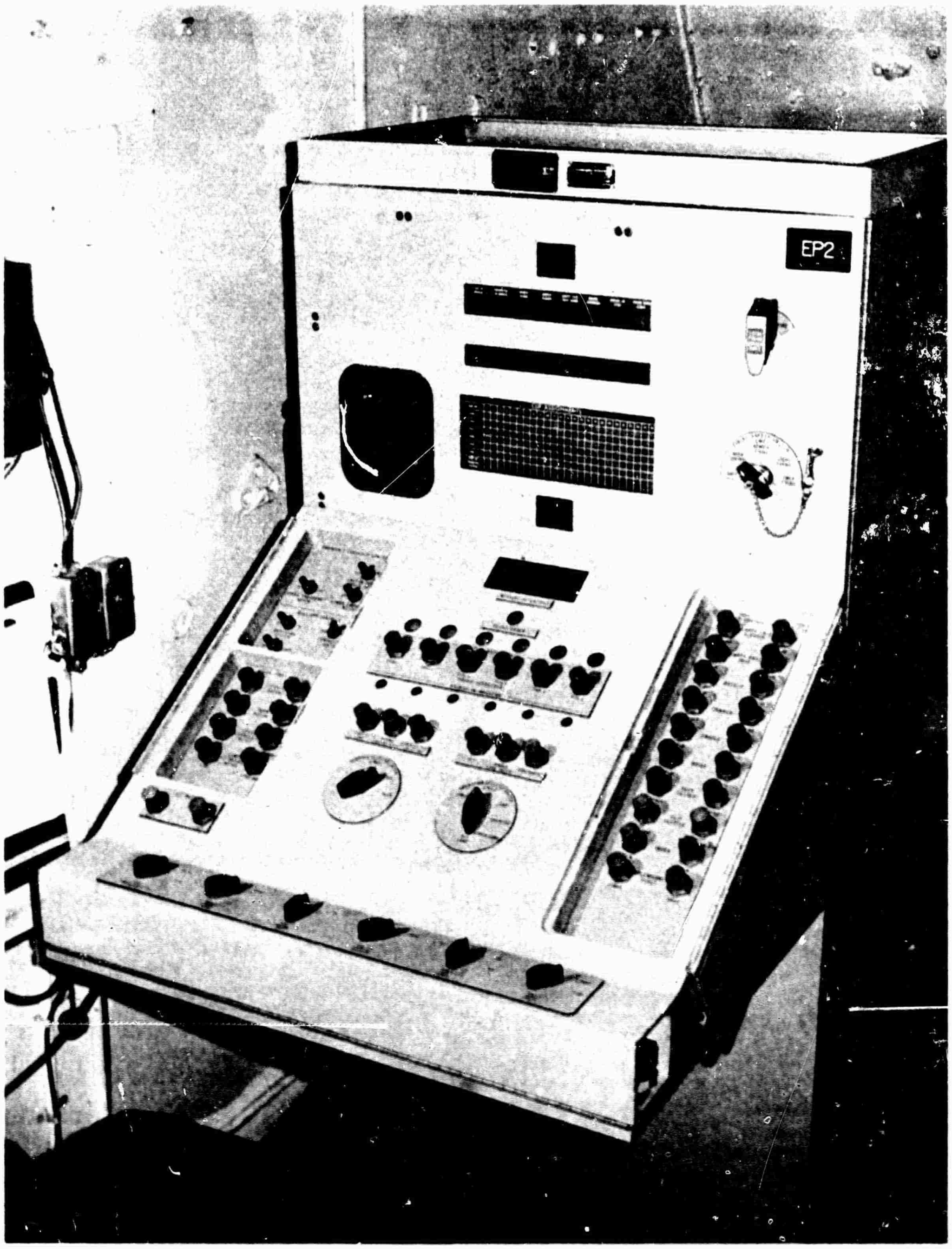
View of the Slide During Assembly of the MCLGM After Conversion to the 8"/55 Caliber



PHD-2500-11-72

FIGURE 4

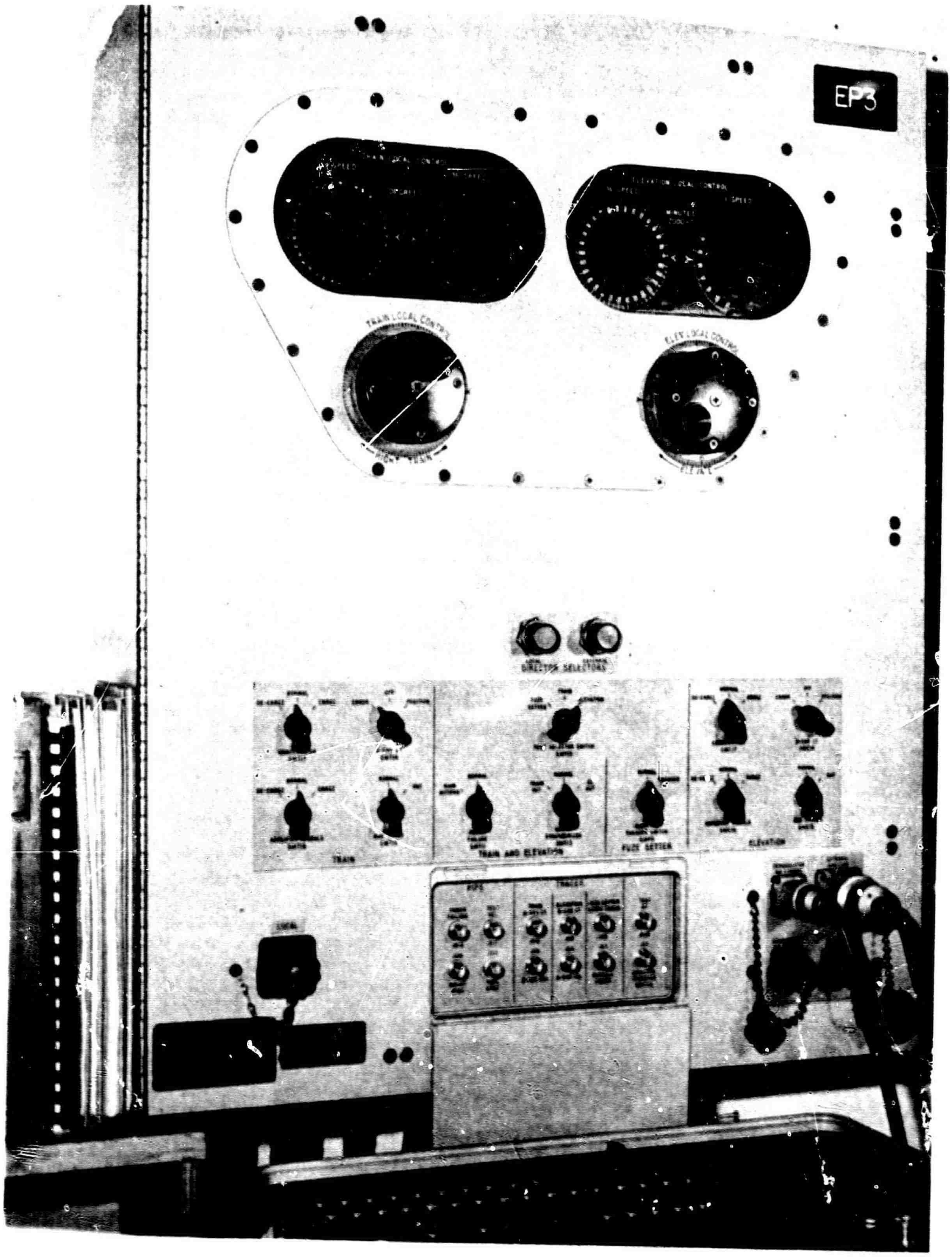
View of the 8"/55 MCLGM EP-1 Panel



PHD-2501-11-72

FIGURE 5

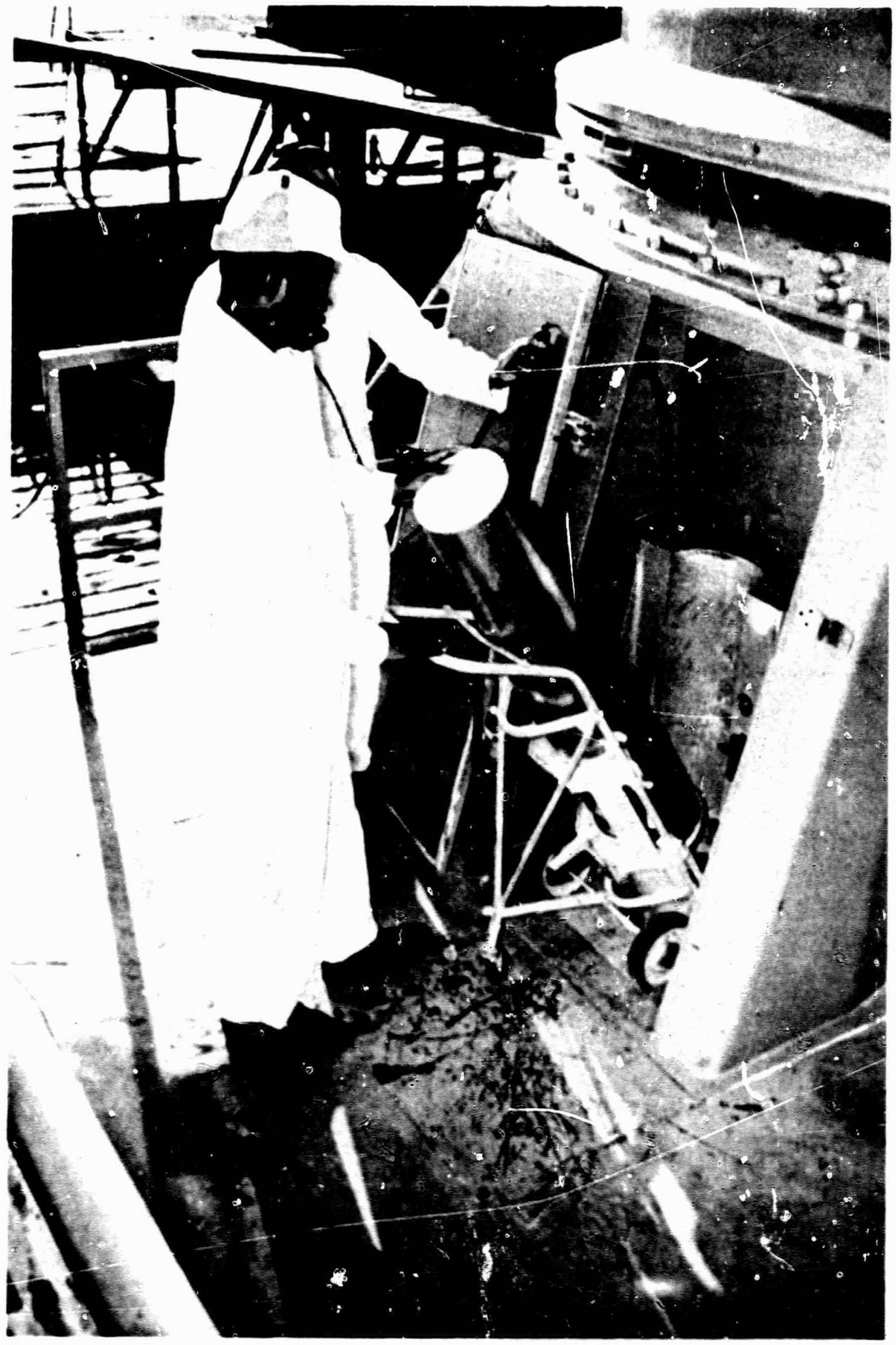
View of the 8"/55 MCLGM EP-2 Panel



PHD-2502-11-72

FIGURE 6

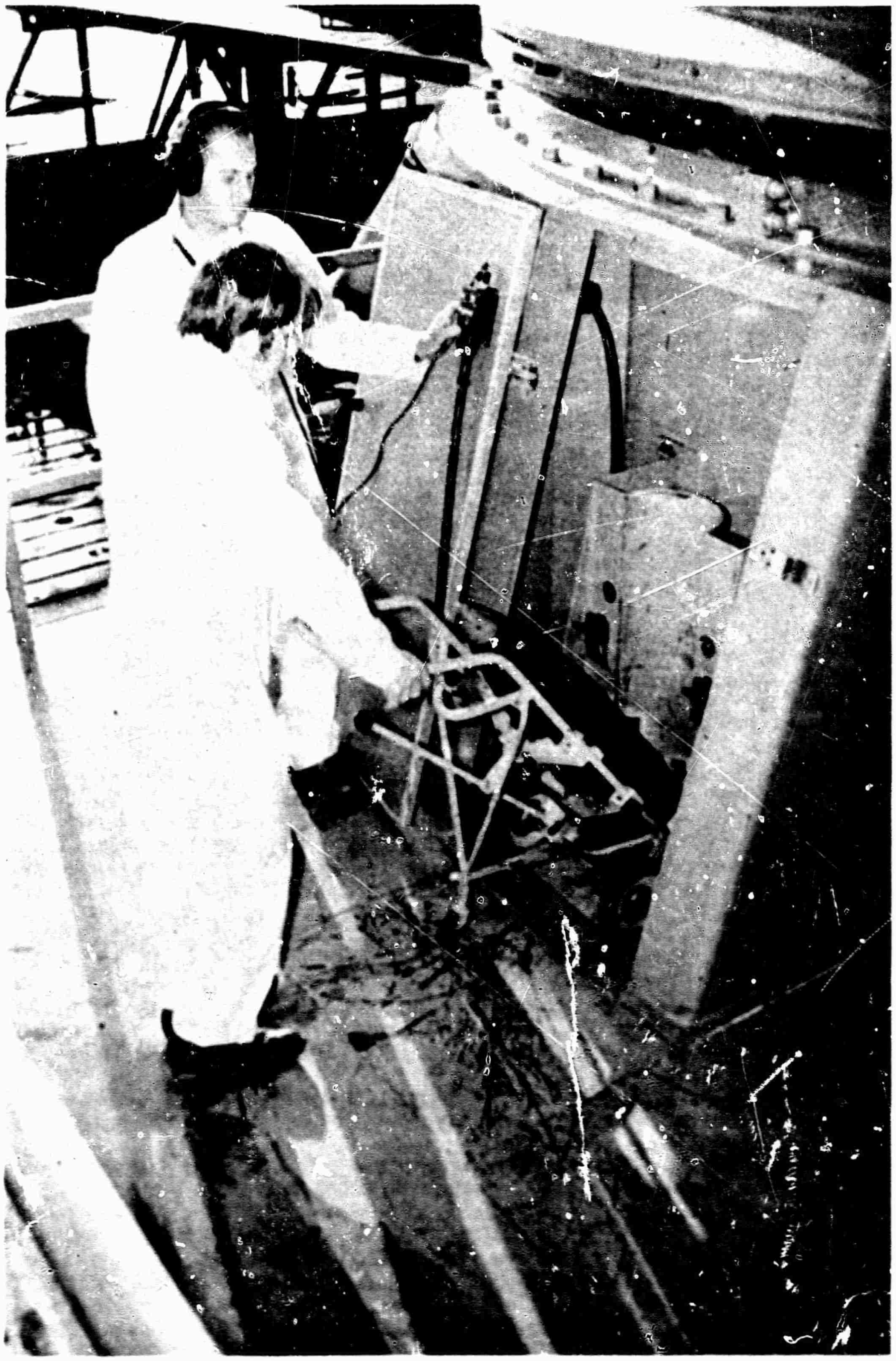
View of the 8"/55 MCLGM EP-3 Panel



PHD-2503-11-72

FIGURE 7

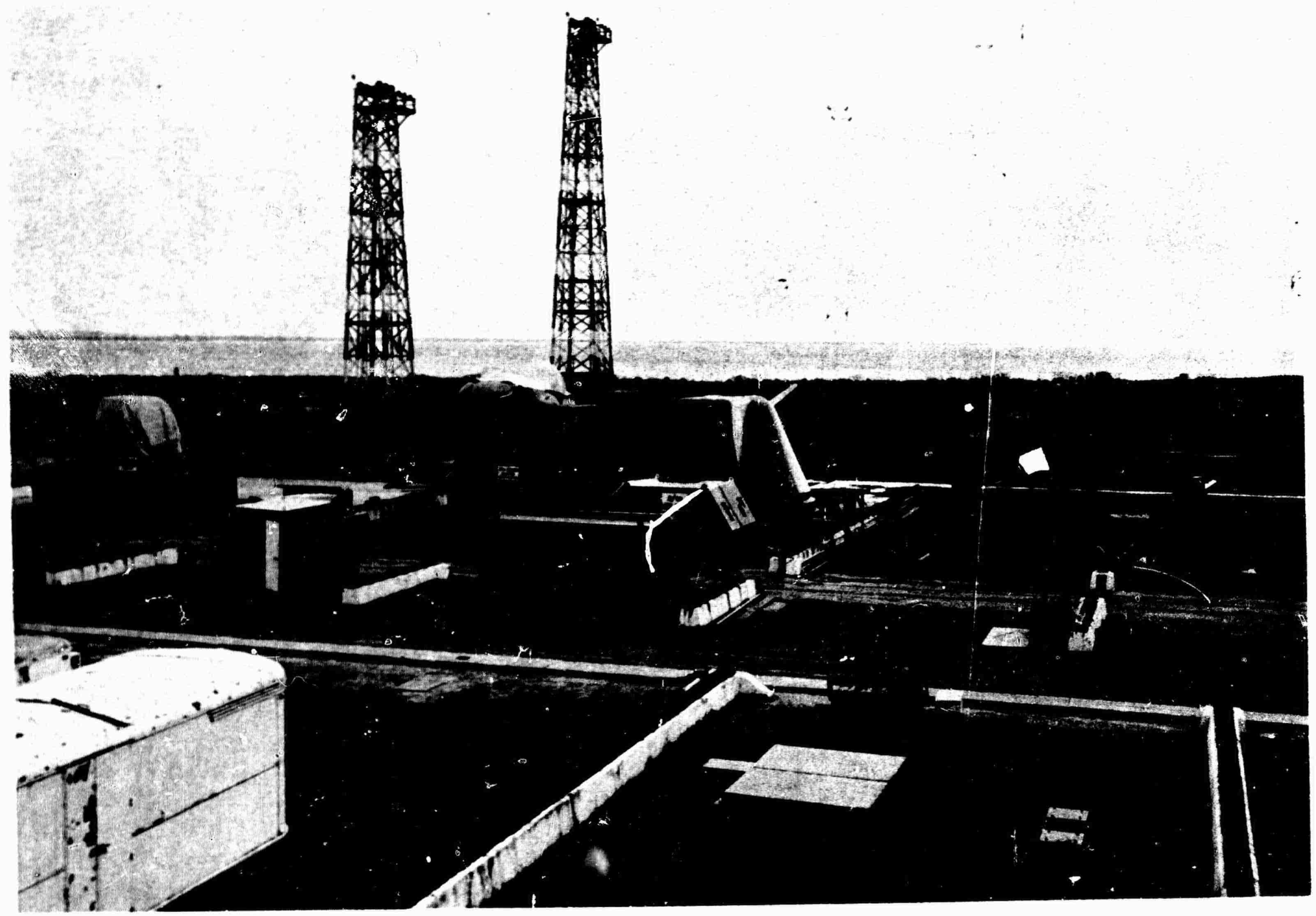
Photograph of a Cartridge Being Placed in the Strikedown Hoist of the 8"/55 MCLGM at NWL



PHD-2504-11-72

FIGURE 8

Photograph of a MARK 25 Projectile Being Placed in the Strikedown Hoist of the 8"/55 MCLGM at NWL



PHD-0180-2-72

FIGURE 9

8"/55 MCLGM Installed at NWL as Viewed From Behind

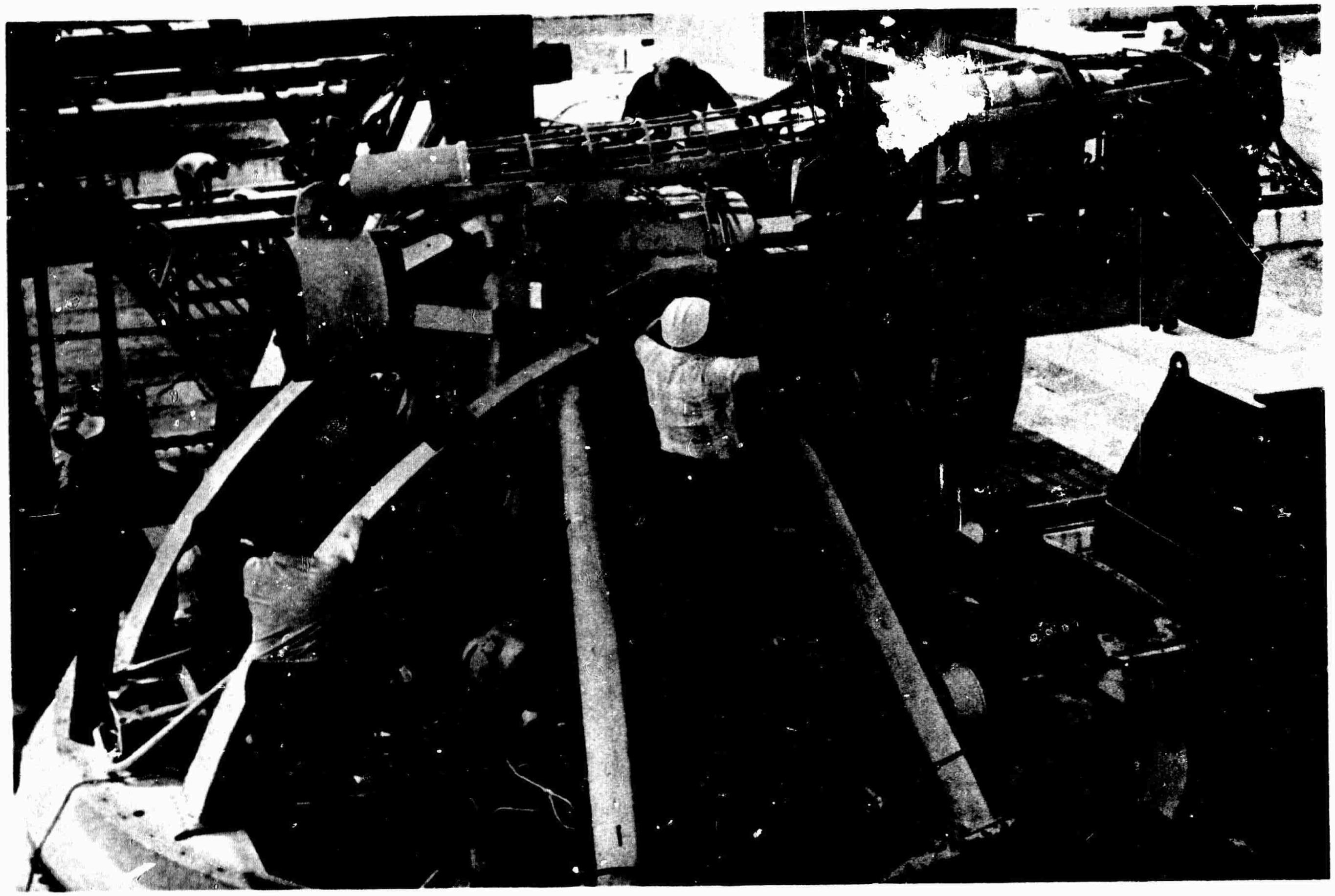


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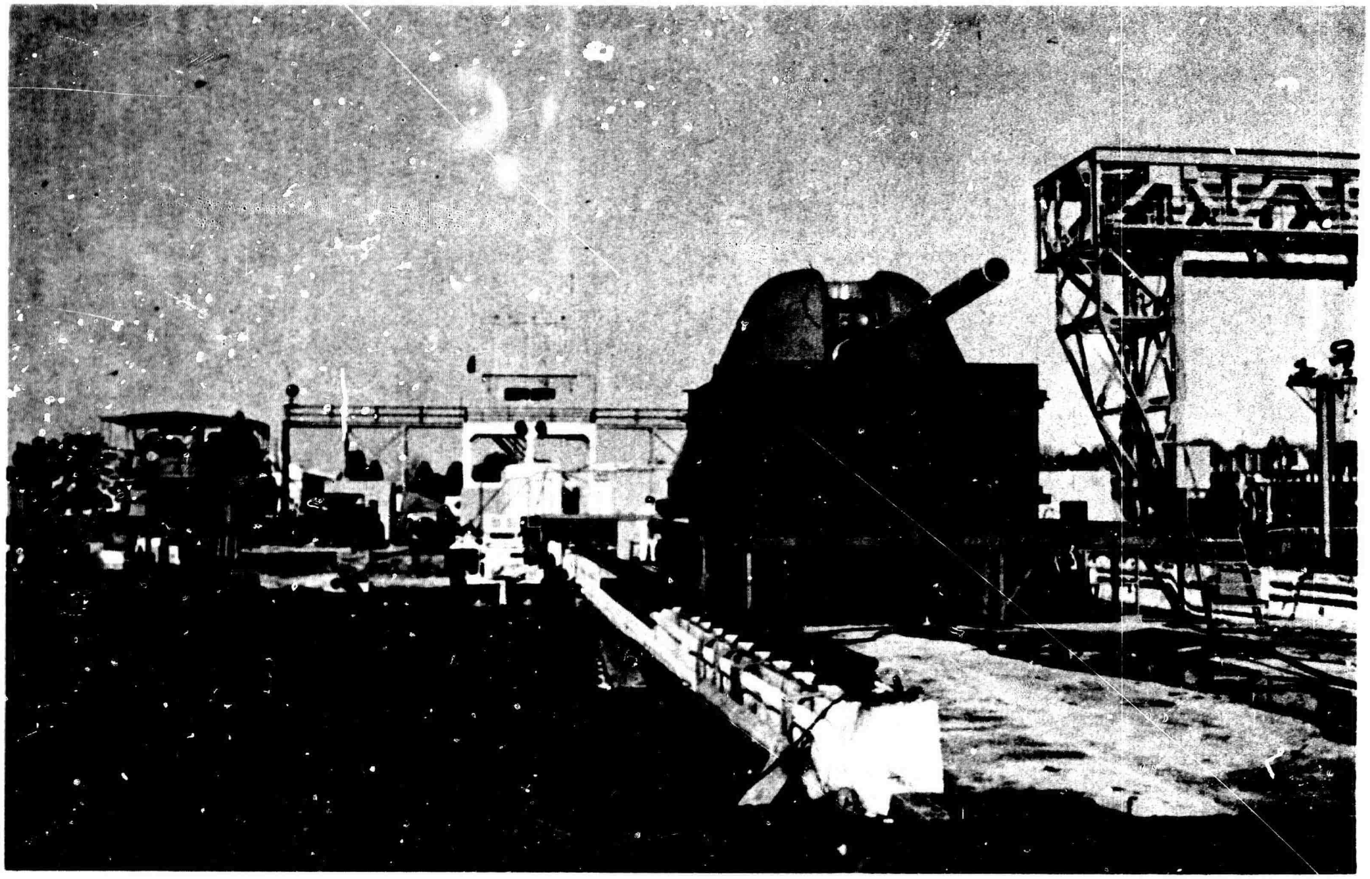
FIGURE 10

View of the MCLGM During Installation of the Slide After Conversion to 8"/55 Caliber



PHD-2506-11-72

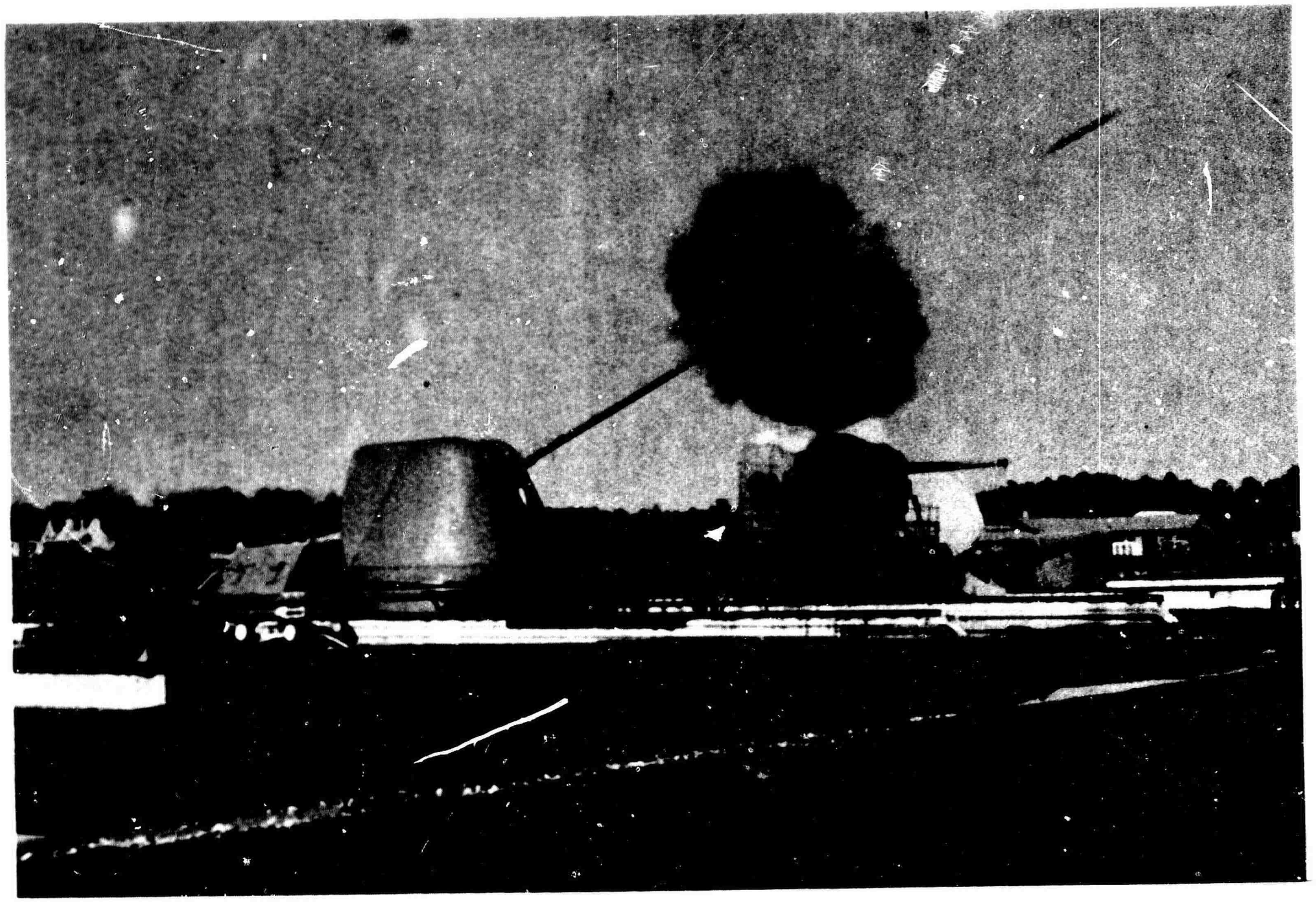
FIGURE 11

8"/55 MCLGM Installation at NWL as Viewed From in Front of the Mount

PHD-2507-11-72

FIGURE 12

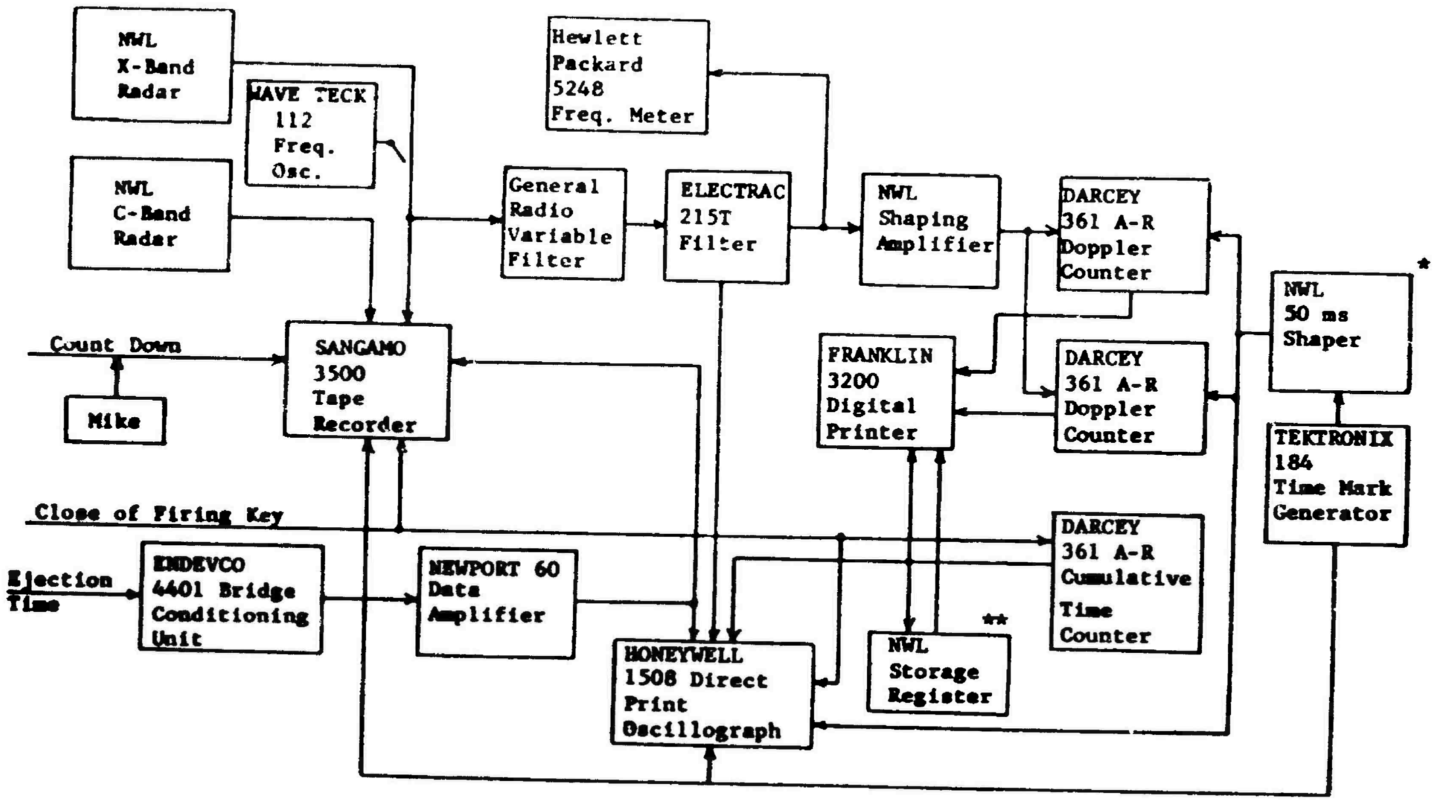
View of the Cartridges and Projectiles Being Loaded at the Strikedown Hoist of the 8"/55 MCLGM at NWL



PHD-0218-2-72

FIGURE 13

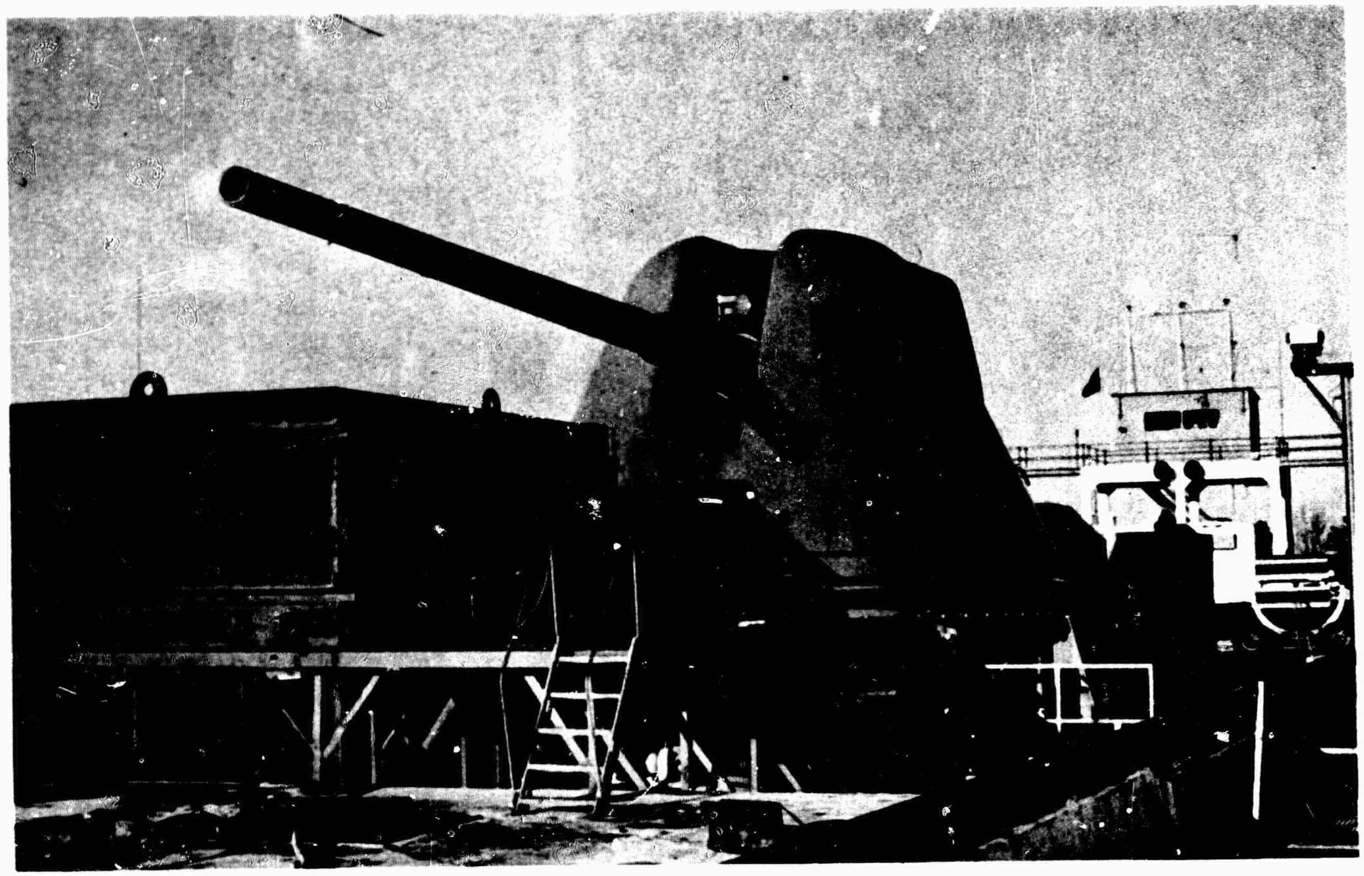
View of the 8".0 MCLGM Firing at NWL



* Gates counters (on-off alternately) to permit counting of doppler cycles.
** Stores time counts until printer can accept them.

FIGURE 14

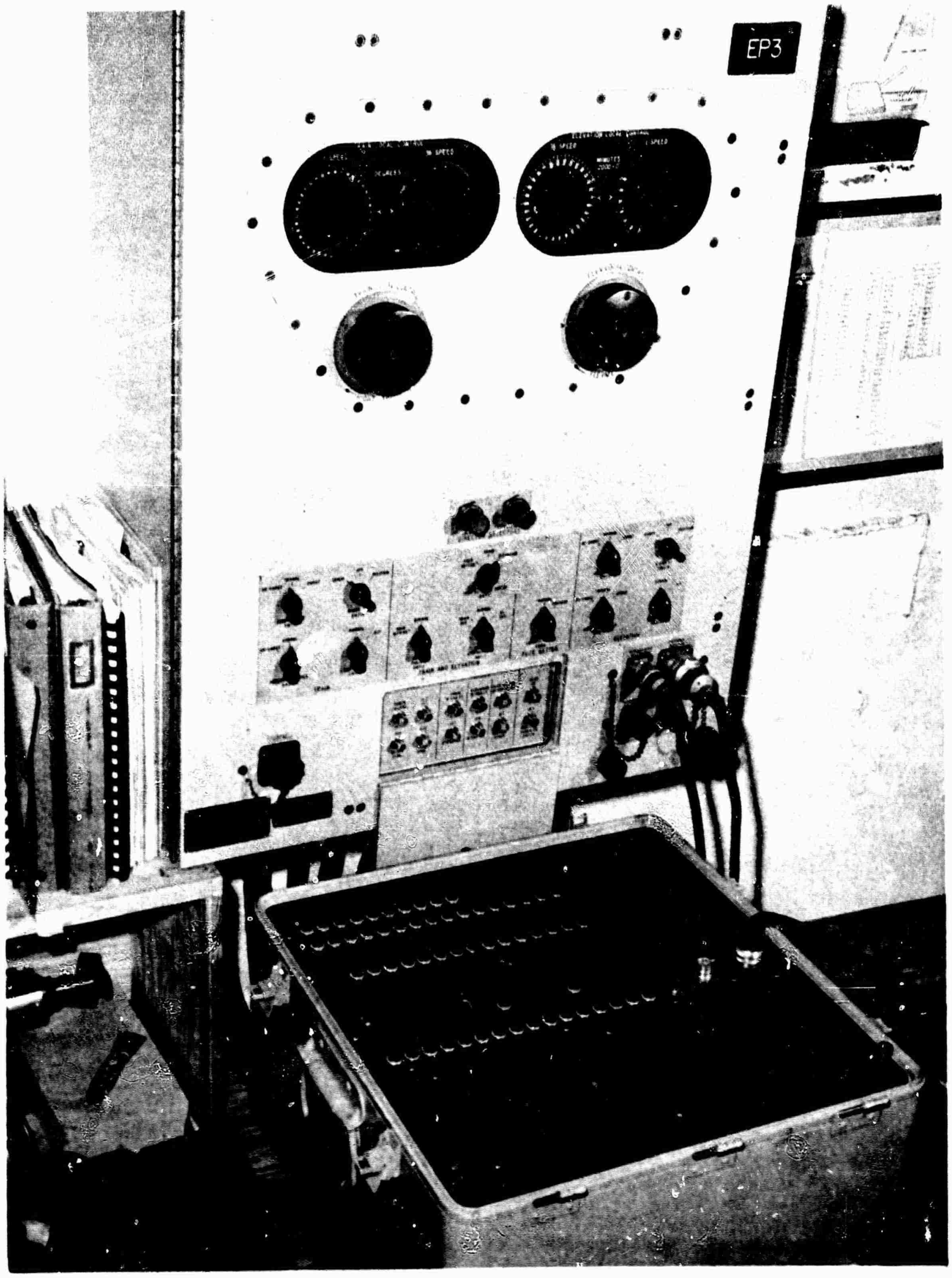
Initial Velocity Data Acquisition System for Doppler Radar



PHD-2508-11-72

FIGURE 15

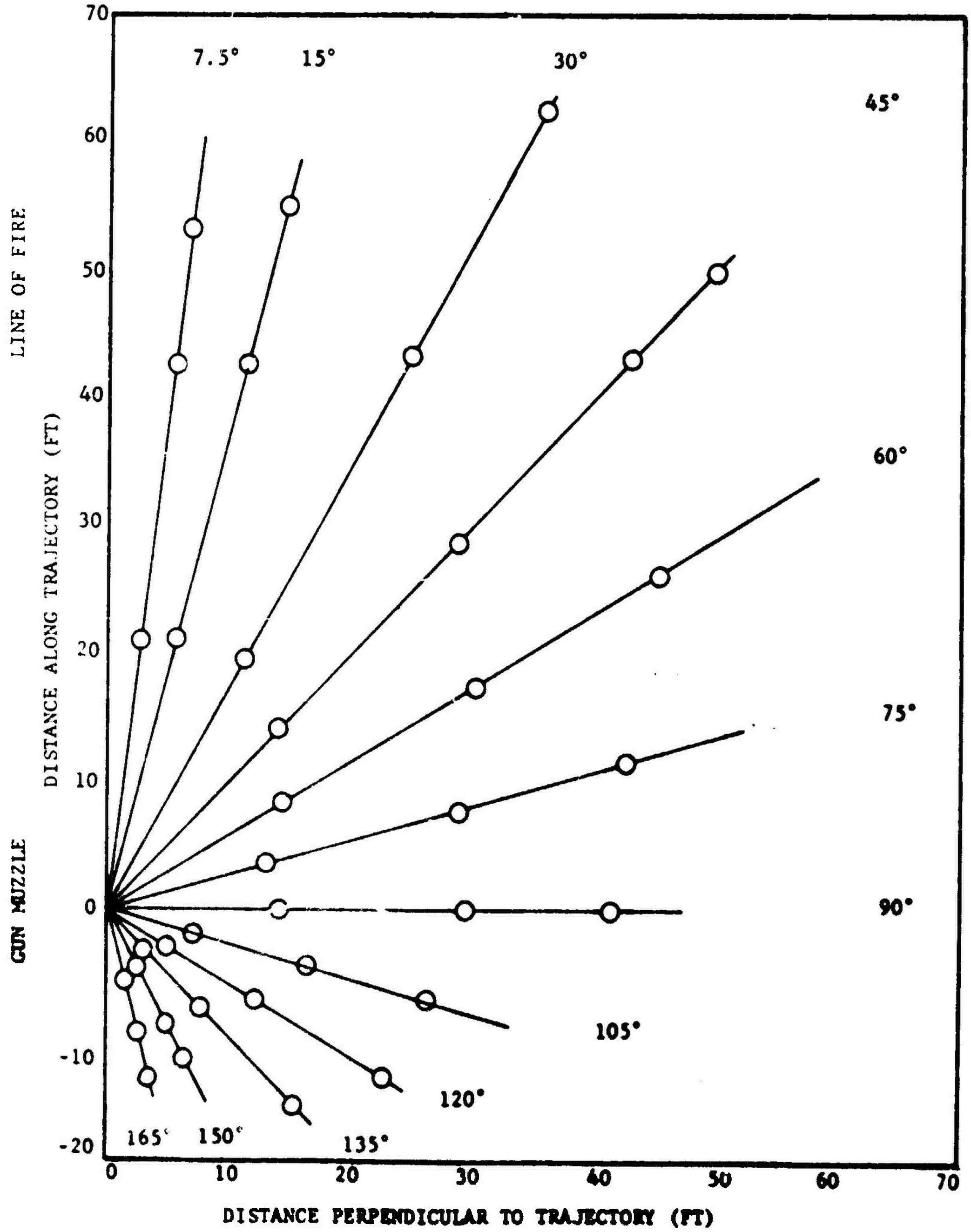
View of the 8".0 MCLGM Showing the C-Band Doppler Radar (on Wheels at the Right)



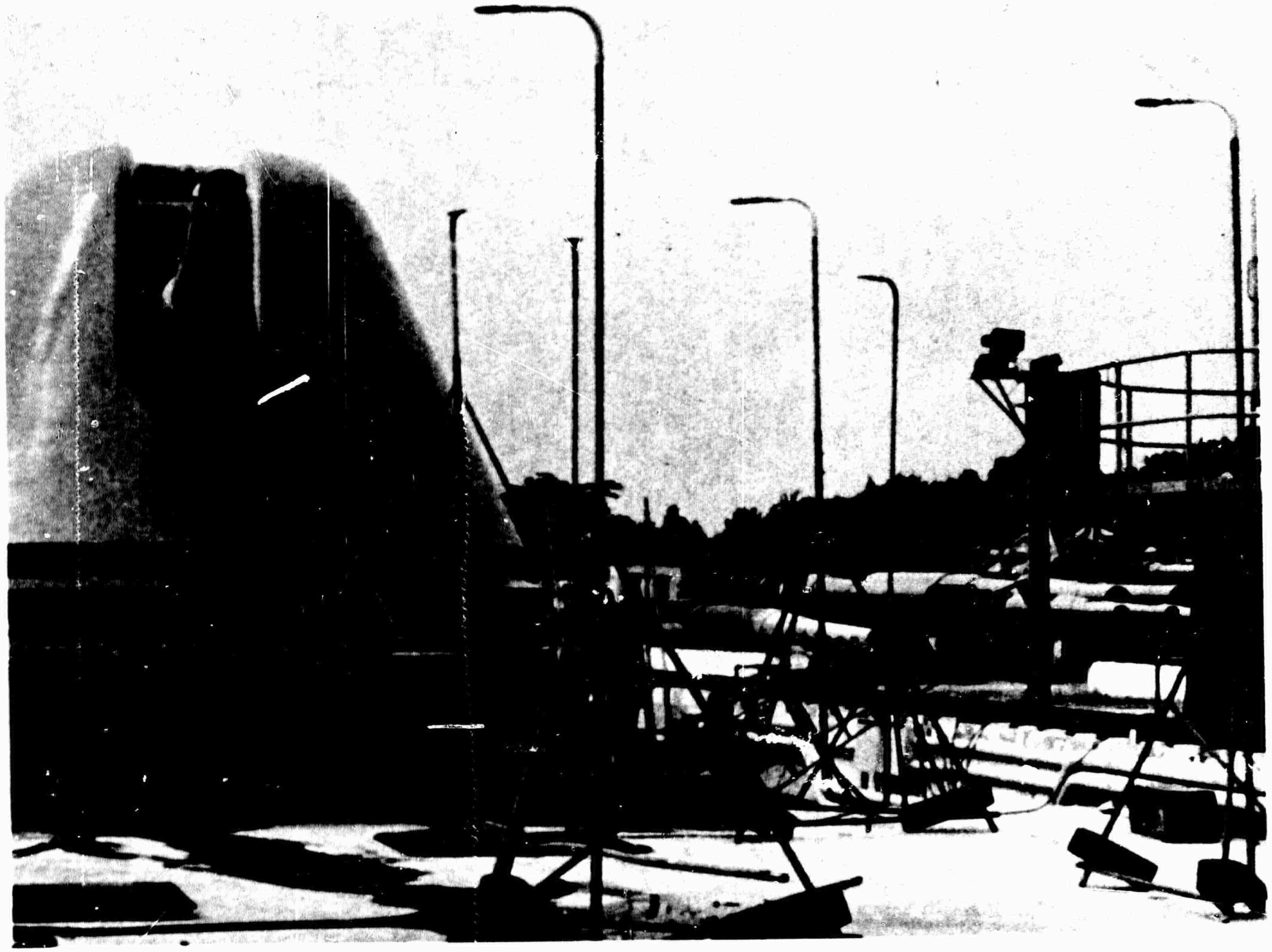
PHD-0172-2-72

FIGURE 16

View of the 8" MCLGM Test Panel (EP-3)
and the Order Signal Generator



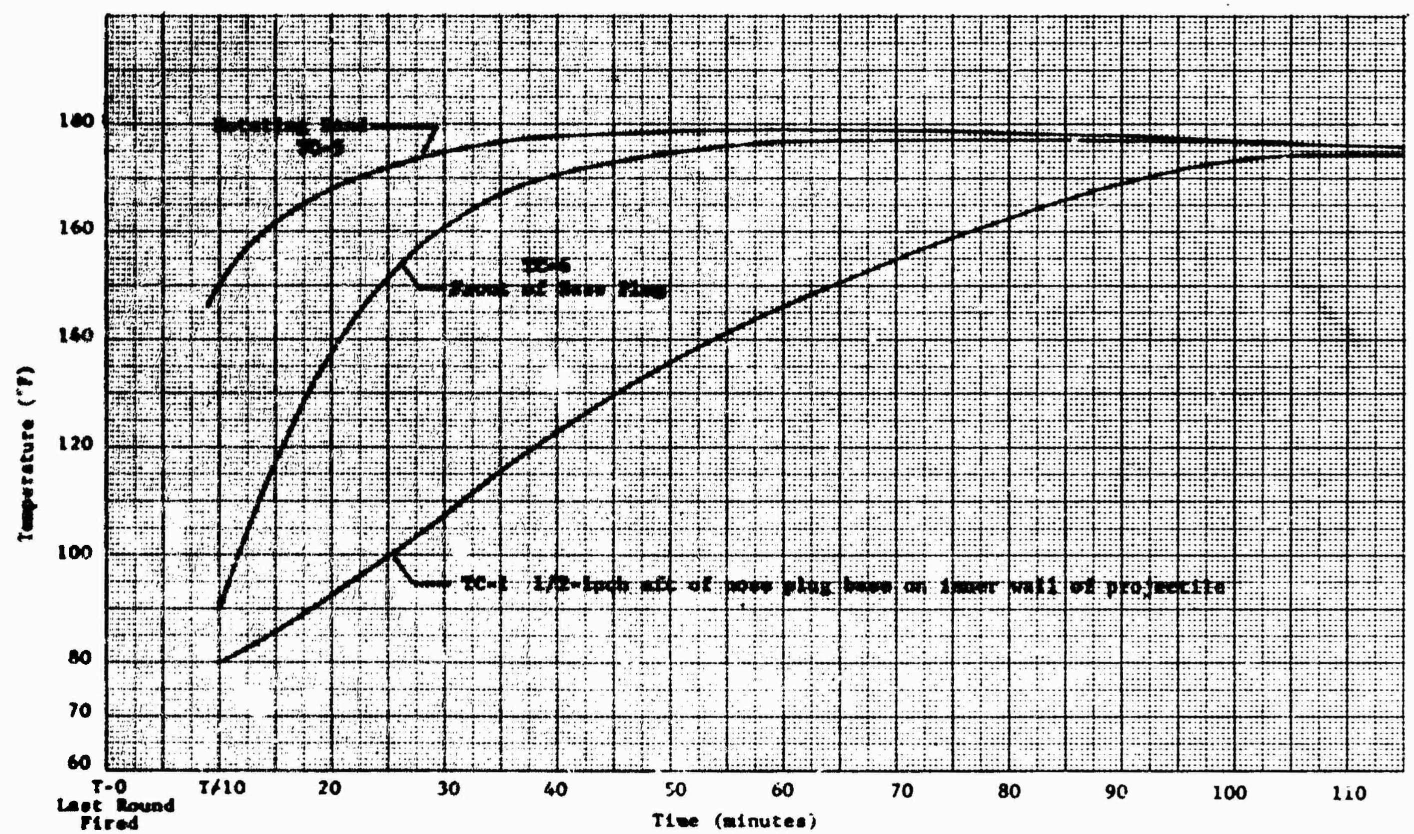
Distance Perpendicular to Trajectory (ft)



PHD-2509-11-72

FIGURE 18

View of Blast Pressure Transducer Arrangement in Front of the 8"/55 MCLGM



PHD-2510-11-72

FIGURE 19

View of Blast Pressure Transducer Arrangement in Front of the 8"/55 MCLGM

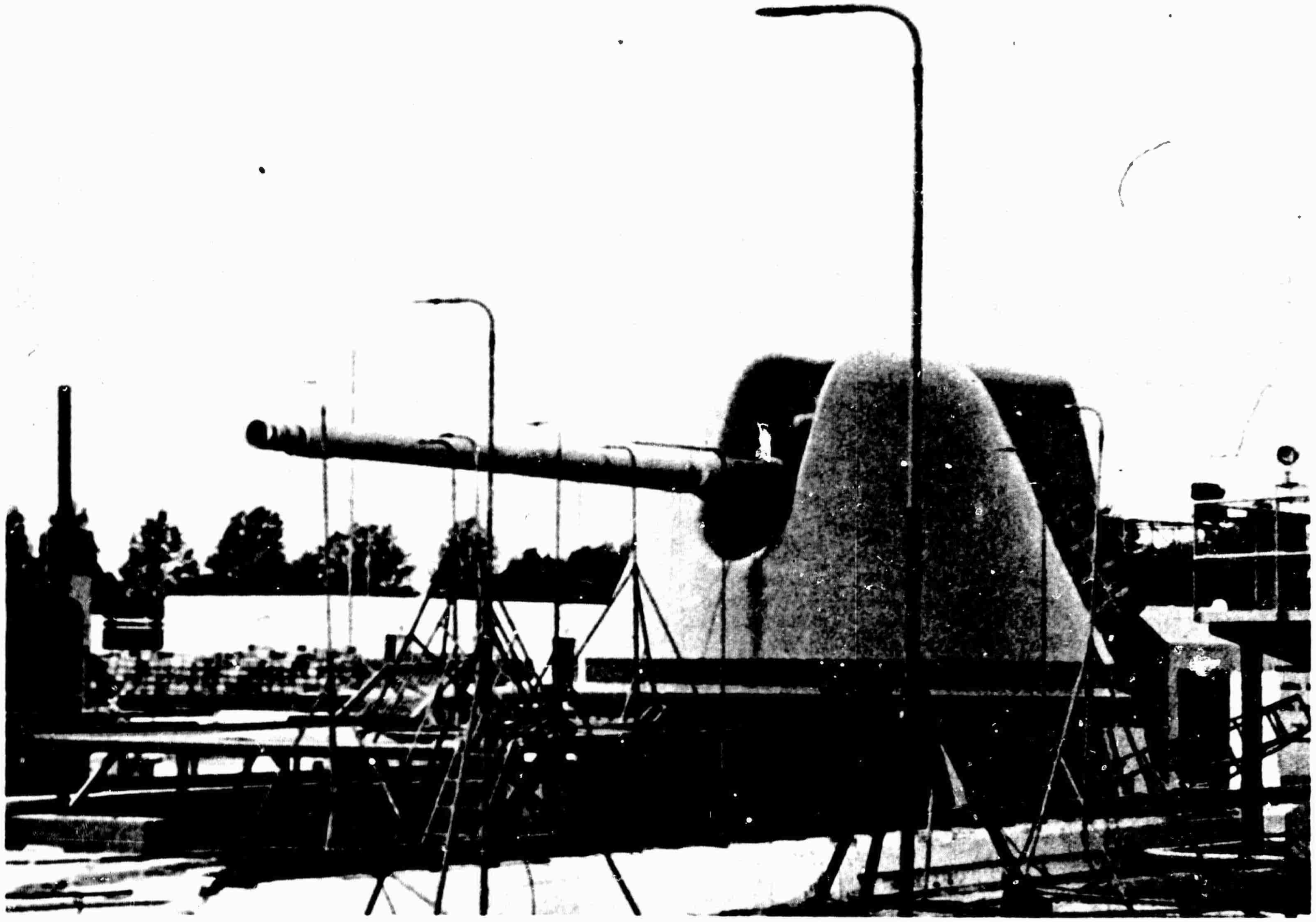
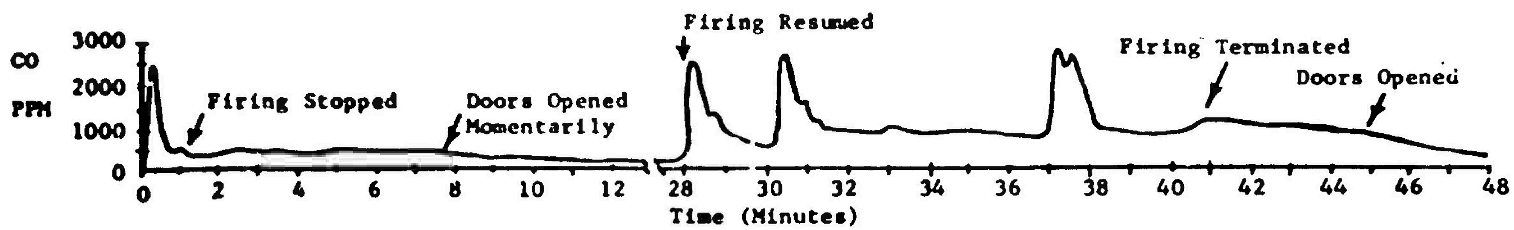


FIGURE 20

Temperature vs Time at Several Locations on an 8″ Projectile

CARBON MONOXIDE DATA FOR LAST 37 ROUNDS SHOT ON 12/13/71

SAMPLE POINT: INSIDE CROWN OF GUN HOUSE, ABOVE BREECH



CARBON MONOXIDE DATA FOR 75 ROUNDS SHOT ON 11/12/71

SAMPLE POINT: FIVE FEET ABOVE DECK IN AFT AREA OF CRADLE ROOM

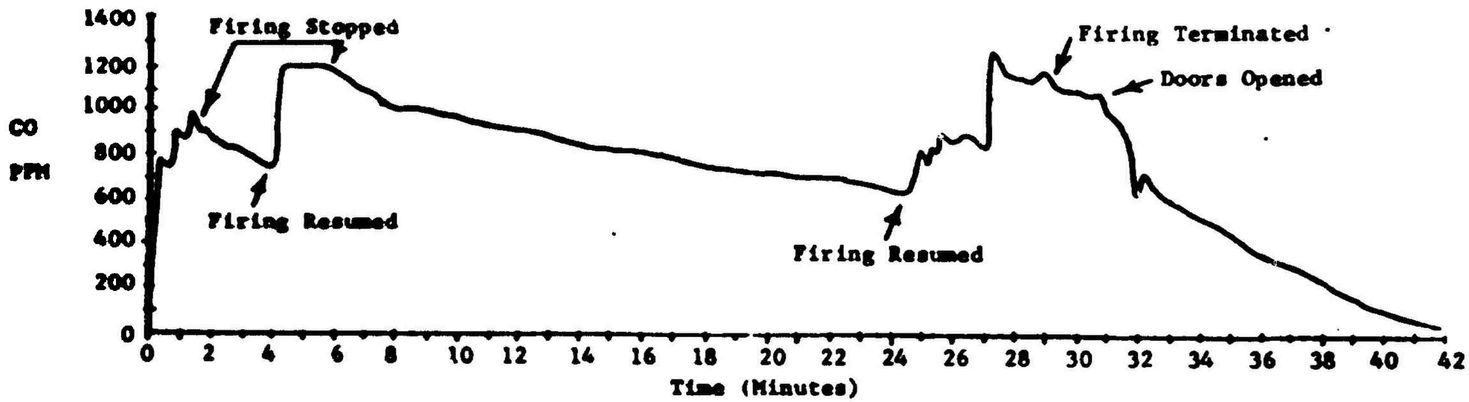
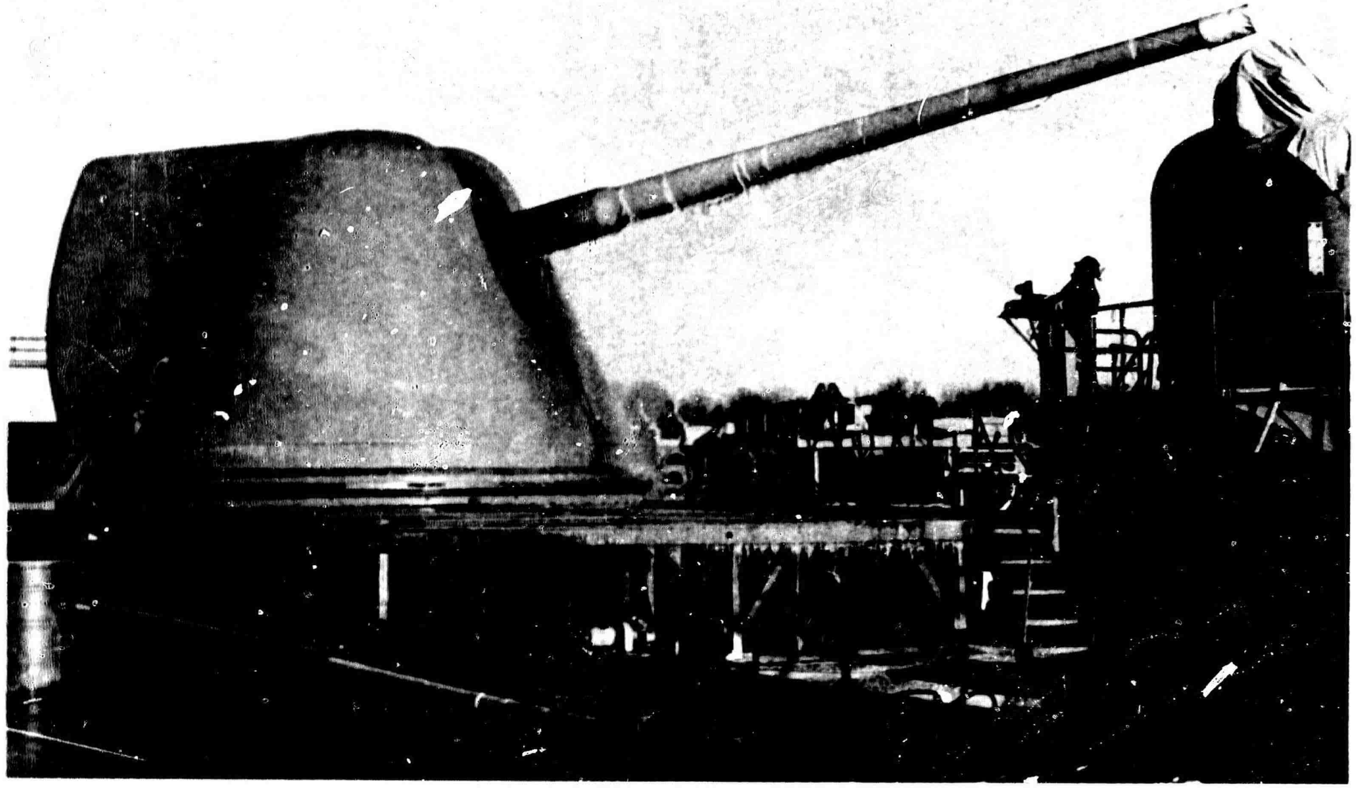


FIGURE 21

Carbon Monoxide Concentration vs Time for 8".0 MCLGM



PHD-2511-11-72

FIGURE 22

View of the 8" MCLGM During Anti-Icing Test

PHD-2512-11-72

FIGURE 23

View of the Gun Port Shield of the 8".0 MCLGM During the Anti-Icing Test

APPENDIX B

Problems Encountered During the TECHEVAL
Table B-1

TABLE B-1

LIST OF PROBLEMS ENCOUNTERED DURING THE 8" MCLGM TECH EVAL

Date (1971)	Description of Problem	Effect of Problem	Corrective Action
9 September	Extractor cylinder operating piston cap was bowed.	Hydraulic leakage	A redesigned cap was installed.
25 September	Bracket for mounting the tachometer assembly to get empty case ejector traces was bent in shipment of the slide to NWL or in installation.	Cannot obtain velocity and position vs. time data for the empty case ejector (Part of MR card C-1 and Tech Eval. Test T-3).	An attempt was made to straighten the bracket, but could not be satisfactorily repaired and this test was omitted.
27-28 Sept	Photocell indicators overly sensitive giving wrong (loaded or unloaded) indications.	Gun stoppage	New type photocells (with the light source on the opposite side of the ammunition train) were installed. This was completed on 30 October.
28 Sept	Rammer failed to ram the round far enough for the round latch to extend.	Gun stoppage	Small pieces of plug were believed jamming between the case and the chamber. Use of the plug with a radius at the circumference and adding another spring on the cradle restrainer reduced plug chipping. Crimping the plugs carefully and removing chips around the crimp also reduced the probability of a chip jamming a case and causing a stoppage. The rammer extend indicating switch was adjusted since this was a possible cause.
Throughout the evaluation	Cartridge cases not extracting freely or partially separating.	Gun stoppage	Heat treating cases and dipping in a sulfuric acid solution, degreasing the ammunition and chamber, and thoroughly cleaning the ammunition corrected this problem at service charge pressures. For proof pressure charges, the heat treated cases were not satisfactory and no corrective action proved successful.
20 Oct	One pin of the Dither Pot in the train receiver regulator was in contact with a pin of a transformer.	Train acceleration too slow.	The Dither Pot was rotated 180° on the assembly and then the entire Dither assembly was rotated 180°.

TABLE B-1 (Continued)

Date (1971)	Description of Problem	Effect of Problem	Corrective Action
22 Oct	Primer blowback on reduced charge.	Misfire on next round because of fouled firing pin.	Problem is the design/quality control of the MARK 38 MOD 2 primer and not associated with the gun mount. No corrective action was taken which would allow the firing pin assembly to continue functioning after a blowback.
Prior to 29 Oct	Counter recoil piston picked up material from their bushings.	Problem was corrected before effects were severe.	New type bushings were installed with teflon seals. This work was completed on 29 Oct and no problems were encountered after that date.
Prior to 1 Nov	Cable not locked to empty case tray solenoid housing	Intermittent stoppage during simulate cycling.	Locked cable.
3 Nov	Fuze for anti-icing pump motor was too small.	Anti-icing pump wouldn't start.	Installed a 15-amp fuze.
11 Nov	Screw on switch actuator on the lower accumulator pump sheared.	Lower accumulator failed to start.	Replaced the screw.
12 Nov	Loose bolt at motor contactor in EP-1 panel.	Motors shut down during simulate cycling.	Tightened bolt.
12 Nov	Loose lead in EP-3 panel	Gun stoppage	Lead was pushed back in jack.

Note: Several instances of finding loose or shorted wires during checkout and maintenance are not listed because of their minor consequence.

APPENDIX C

List of Technical Evalution Tests
Table C-1

TABLE C-1

8"/55 MCLGM TECHNICAL EVALUATION
LIST OF TESTS CONDUCTED

TRAIN POWER DRIVE TESTS
- Accuracy Tests
- Maximum Velocity and Acceleration Tests
- Synchronizing Time Tests
- Synchro Power Failure Tests
- Limit Stop Tests
- Emergency Limit Stop Tests
- Frequency Response Tests

ELEVATION POWER DRIVE TESTS
- Accuracy Tests
- Maximum Velocity and Acceleration Tests
- Synchronizing Time Tests
- Synchro Power Failure Tests
- Limit Stop Tests
- Emergency Limit Stop Tests
- Frequency Response Tests

AMMUNITION LOADING SYSTEM TESTS
- Drum Indexing
- Clip Transferring
- Hoist Operation
- Cradle Operation
- Breechblock Operation
- Empty Case Tray Operation
- Rammer Operation
- Hoist Pawl Positioner Operation
- Round Centering Snubber and Latch Operation

AMMUNITION SELECTABILITY TEST

ELECTRICAL POWER CONSUMPTION TEST

TEST OF MISFIRE PROCEDURES

TEST OF REGUNNING PROCEDURES AND PROVISIONS

PROOF TESTS

CARTRIDGE ASSEMBLY TESTS

RATE OF FIRE TESTS

GUN JUMP TESTS

ACCURACY AND RANGE TABLE TESTS

BARREL LIFE AND VELOCITY LOSS STUDIES

PROJECTILE COOK-OFF TESTS

REDUCED CHARGE TESTS

SAFETY ANALYSIS

GUN BLAST TESTS

SMOKE AND FUMES TESTS

ANTI-ICING SYSTEM TEST

T... differs from the list of tests in R... erence 5 in the f... owing ways:

AMMUNITION SELECTABILITY TEST. This test is listed separately rather than as a part of the loading system test.

HEAT RISE. This test was omitted because the schedule precluded doing it after installation of the air conditioning and before the OPEVAL was begun (the test was not regarded to be of primary importance). The heat exchanger was found to be leaking after the OPEVAL, and a new one is being procured. Plans are currently to perform this test after installation of a new heat exchanger and report results by separate correspondence.

RECOIL AND SHIPS LOADING. It is not planned to perform this test since there is doubt as to the importance of the results.

PROJECTILE/CARTRIDGE COOK-OFF. Projectile cook-off is listed but cartridge cook-off is not because it would not present the same degree of hazard if precautions are observed.

EMR INTERFERENCE. This test was conducted during the OPEVAL and is reported in Reference 5.

FIRE OUT. This test is combined with the other tests and . .ot listed separately here.

SMOKE AND FUMES. Smoke and fumes data were accrued during both the TECHEVAL and OPEVAL, and are covered in this report as well as in Reference 6.

ANTI-ICING SYSTEM TEST. Weather conditions did permit some testing of the anti-icing system, hence it is included here.

APPENDIX D

Train Power Drive Test Data
Table D-1
Figures 1 Through 47

TABLE D-1

8"/55 MCLGM TECHNICAL EVALUATION
TRAIN POWER DRIVE TEST DATA

ACCURACY TESTS

Figure Number	Input Signal	Error (min)
	Stationary	
1	60°	0.1
1	90°	0.1
1	120°	0.1
	Constant Velocity	
2	5°/sec	0.75
3	-5°/sec	0.5
4	15°/sec	1.3
4	-15°/sec	1.1
5	25°/sec	1.5
6	-25°/sec	1.75
	Simple Harmonic Motion (Amplitude-Period)	
7	30° - 9 sec	1.5
8	15° - 4.5 sec	10.0

MAXIMUM VELOCITY AND ACCELERATION TESTS

Figure Number	Maximum Velocity (deg/sec)	Max. Acceleration (deg/sec^2)
9	31	-62.2
10	-32	61.3

SYNCHRONIZING TIME TESTS

x Figure Number	Input Signal Order[1]	Order[2]	Initial Error (deg)	Mount Motion Induced	Synchronizing Time (sec)
11	Stationary	Stationary	-5	Right Train	0.63
12	Stationary	Stationary	+5	Left Train	0.68
13	Stationary	Stationary	-20	Right Train	1.31
14	Stationary	Stationary	+20	Left Train	1.32
15	Stationary	Stationary	-45	Right Train	2.10
16	Stationary	Stationary	+45	Left Train	2.09
17	Stationary	Stationary	-90	Right Train	3.50
18	Stationary	Stationary	+90	Left Train	3.48
19	Stationary	C.V. 5°/sec	0	Right Train	0.44
20	Stationary	C.V. 5°/sec	-60	Right Train	2.89
21	Stationary	C.V. 10°/sec	0	Right Train	0.39
22	Stationary	C.V. 5°/sec	+60	Left, Then Right	2.31
23	Stationary	C.V. 10°/sec	+60	Left, Then Right	2.12

TABLE D-1 (Continued)

SYNCHRO POWER FAILURE TESTS

Figure Number	Mount Motion	Maximum Deceleration (deg/sec²)	Distance Traveled After Failure (From Dials)
24	Right Train 31.9 deg/sec	105.5	9° 9′
25	Left Train 32 deg/sec	104.2	10° 23′

LIMIT STOP TESTS

Figure Number	Mount Motion Into Stop		Maximum Deceleration (deg/sec²)
	Direction	Velocity	
26	Right Train	15 deg/sec	51.3
27	Left Train	-15 deg/sec	42.7
28	Right Train	Maximum	45.5
29	Left Train	Maximum	48.0

Figure Number	Mount Order	Mount Motion Out of Stop	Synchronizing Time (sec)
30	Constant Veloxity of 15°/sec	Right Train	0.24
31	Constant Veiocity of -15°/sec	Left Train	0.24

EMERGENCY LIMIT STOP TESTS

Figure Number	Mount Motion Into Stop		Maximum Deceleration (deg/sec²)	Distance Traveled Past Stop Setting (From Dials)
	Direction	Velocity		
32	Right Train	15 deg/sec	88	1°46′
33	Left Train	-15 deg/sec	67	1°49′
34	Right Train	Maximum	88	6°59′
35	Left Train	Maximum	77	7°10′

FREQUENCY RESPONSE TESTS

Figure Number	SHM Input Signal Frequency (Hz)	Amplitude Ratio Output/Input	Approximate Phase Angle (deg)
36	0.23	1.05	0
37	0.48	1.12	7.0
38	0.68	1.15	4.9
39	0.89	1.30	9.6
40	1.4	1.45	20.0
41	2.0	1.55	45.4
42	2.8	1.45	68.0
43	3.6	1.28	146
44	3.9	0.90	166
45	5.3	0.20	157
46	7.4	0.33	154
47	7.9	0.33	163

Figure 1   Accuracy Test, stationary input signal, mount trained at 60°, 90° and 120°

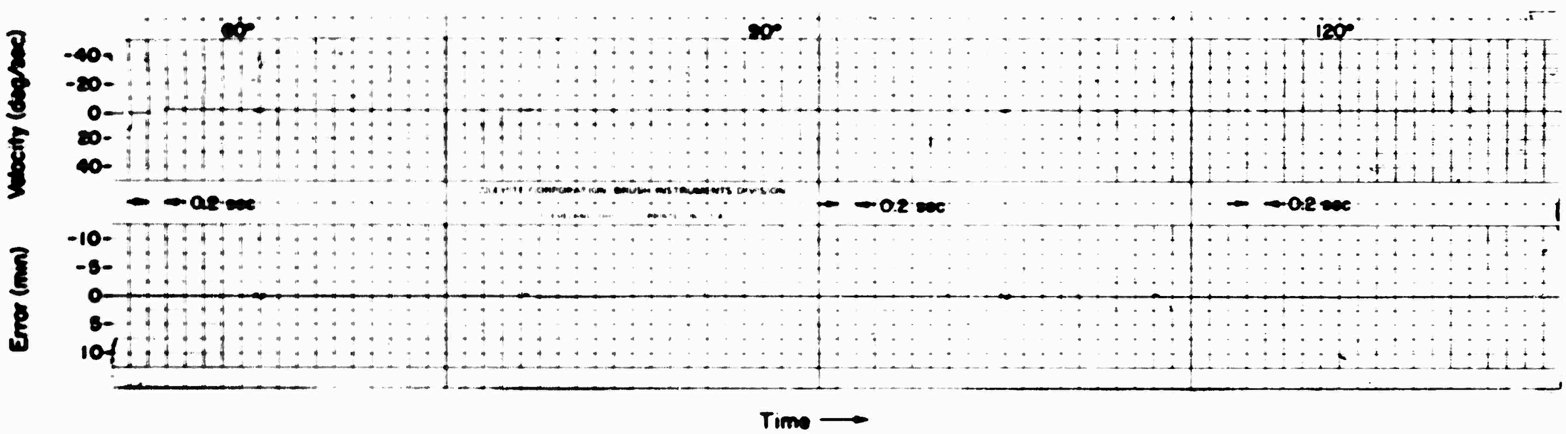


Figure 2. Accuracy Test, contant velocity input signal of 5°/sec (right train).

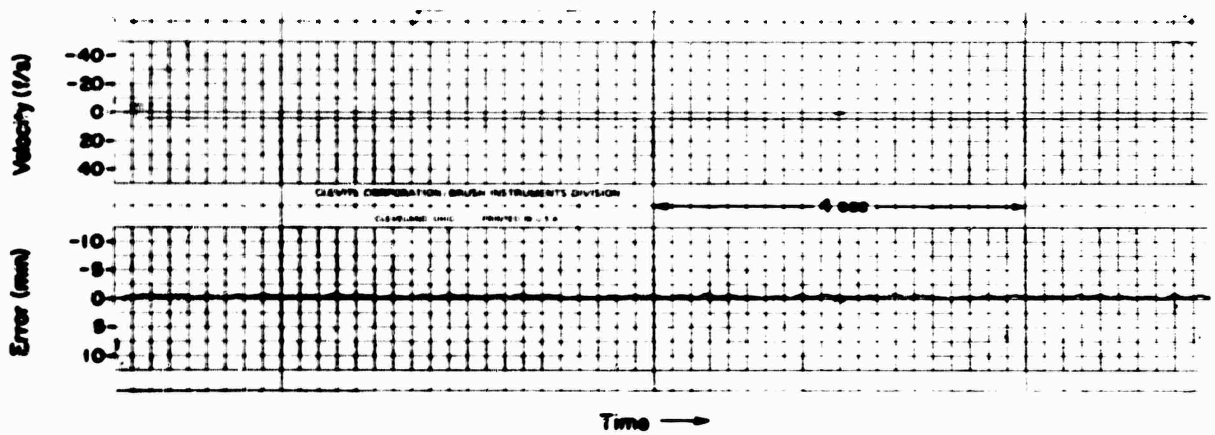


Figure 5. Accuracy Test, contant velocity input signal of 25°/sec.

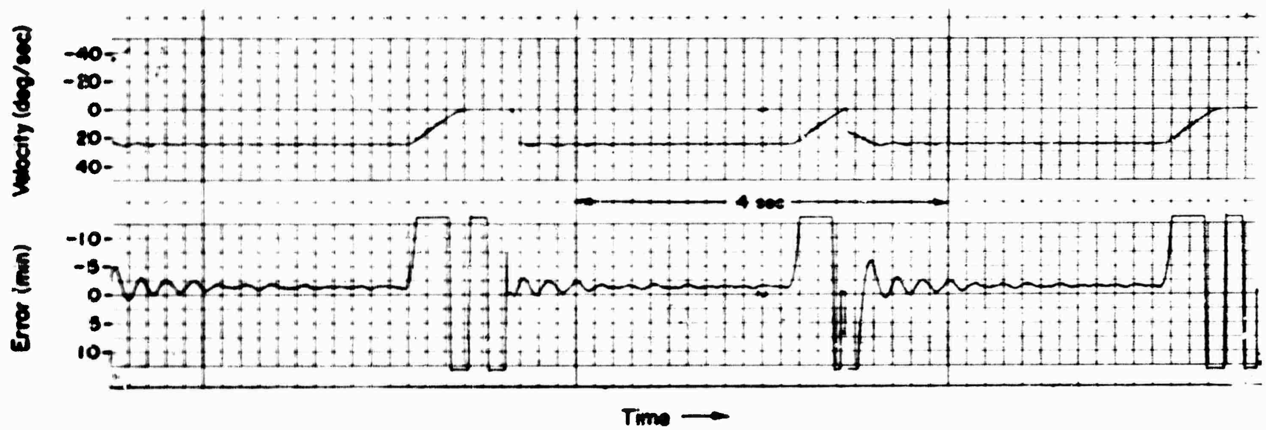


Figure 6. Accuracy Test, constant velocity input signal of -25°/sec.

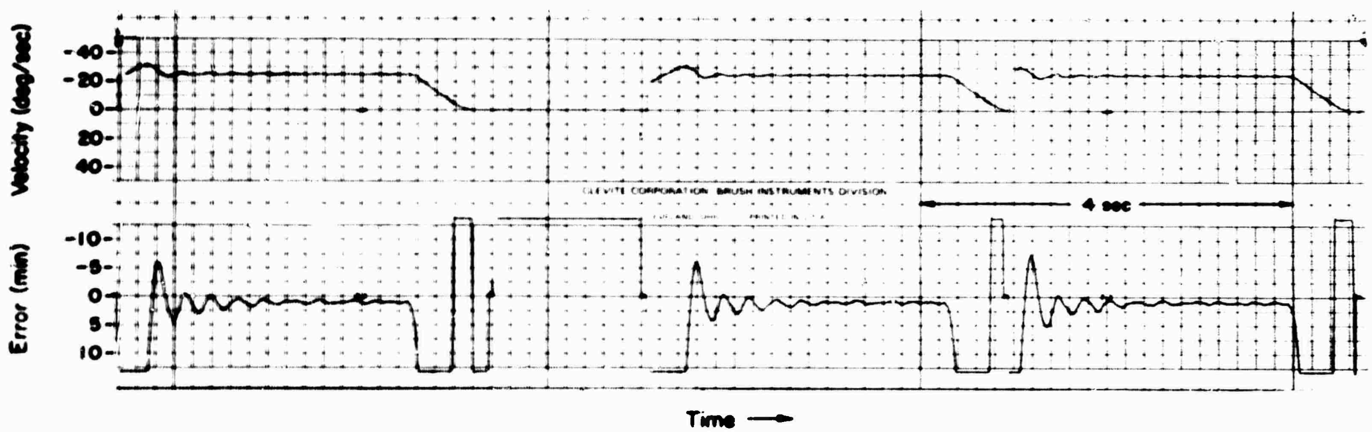


Figure 7 Accuracy Test, SHM input signal of 30° amplitude and 9 sec period.

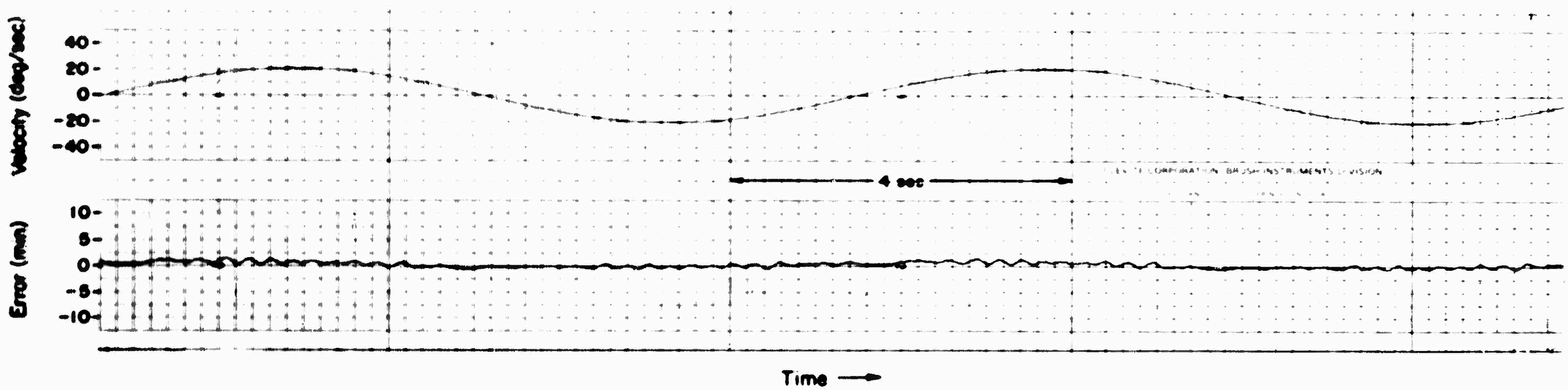


Figure 8. Accuracy Test, SHM input signal of 15° amplitude and 4.5 sec period.

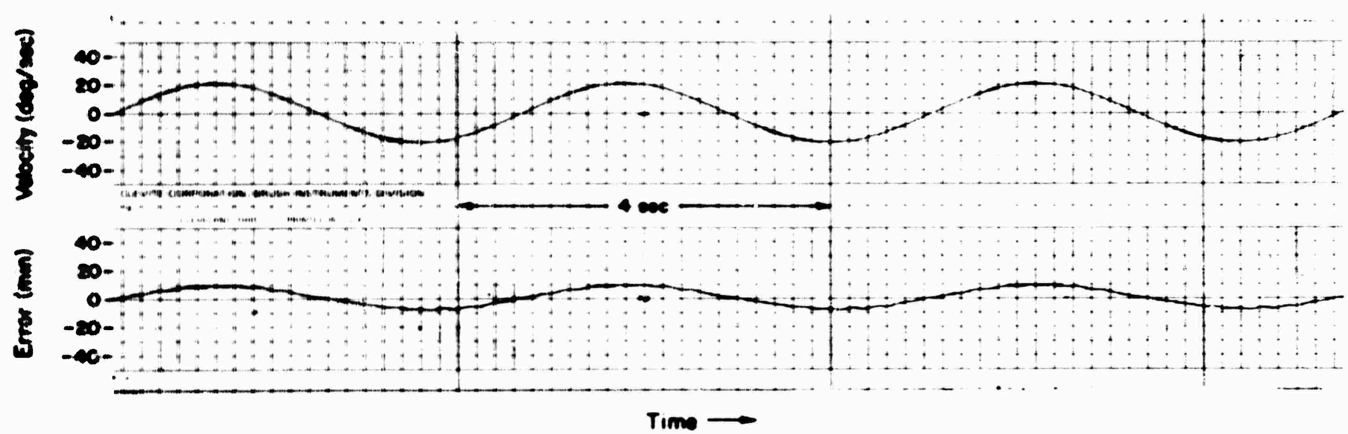


Figure 9. Maximum Velocity and Acceleration Test, stationary input signals: Fixed point to a point to the right and back (after maximum right train velocity is reached) to the original point.

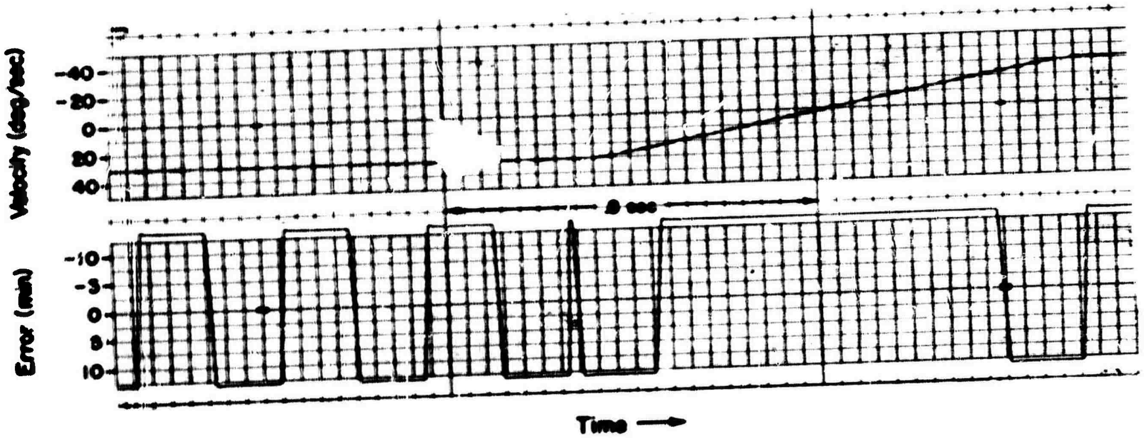


Figure 10. Maximum Velocity and Acceleration Test, stationary input signals: Fixed point to a point to the left and back (after maximum left train velocity is reached) to the original point.

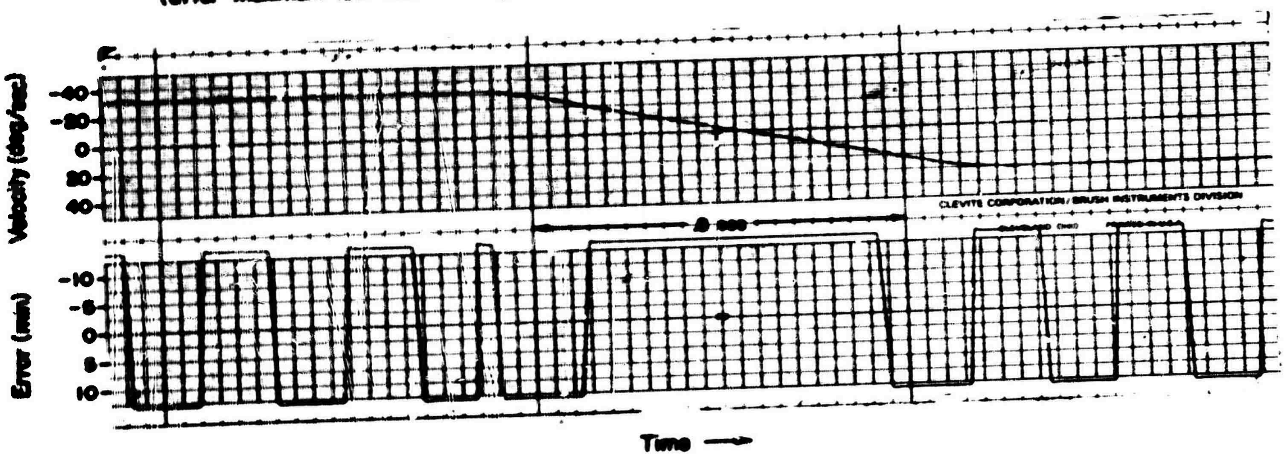


Figure 11. Synchronizing Time Test, stationary input signal 5° to the right.

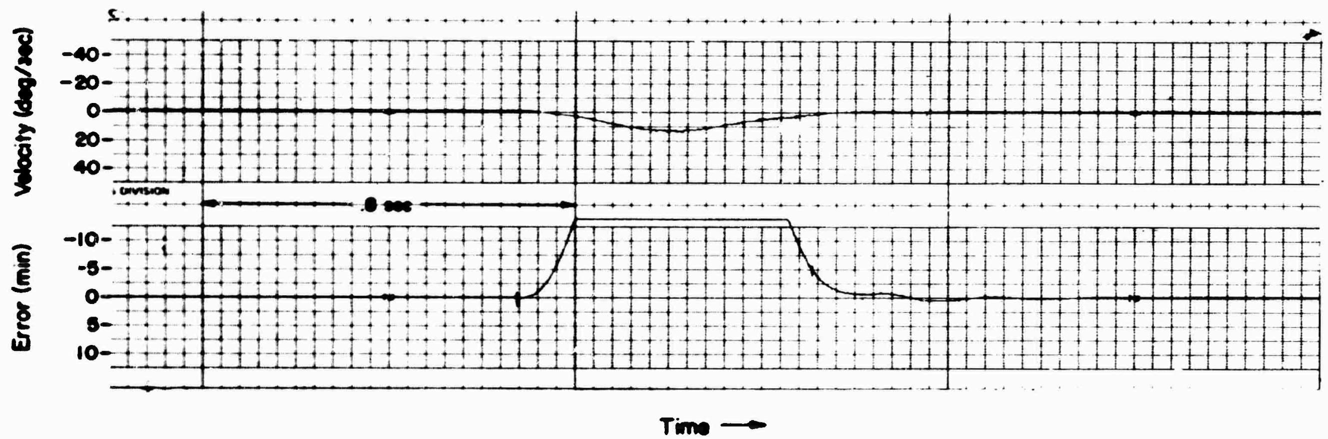


Figure 12. Synchronizing Time Test, stationary input signal 5° to the left.

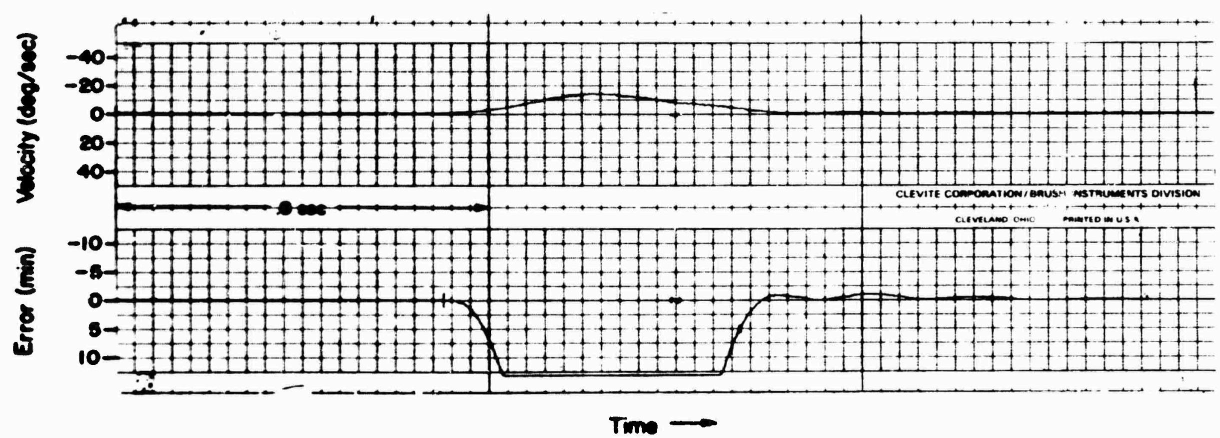


Figure 13. Synchronizing Time Test, stationary input signal 20° to the right.

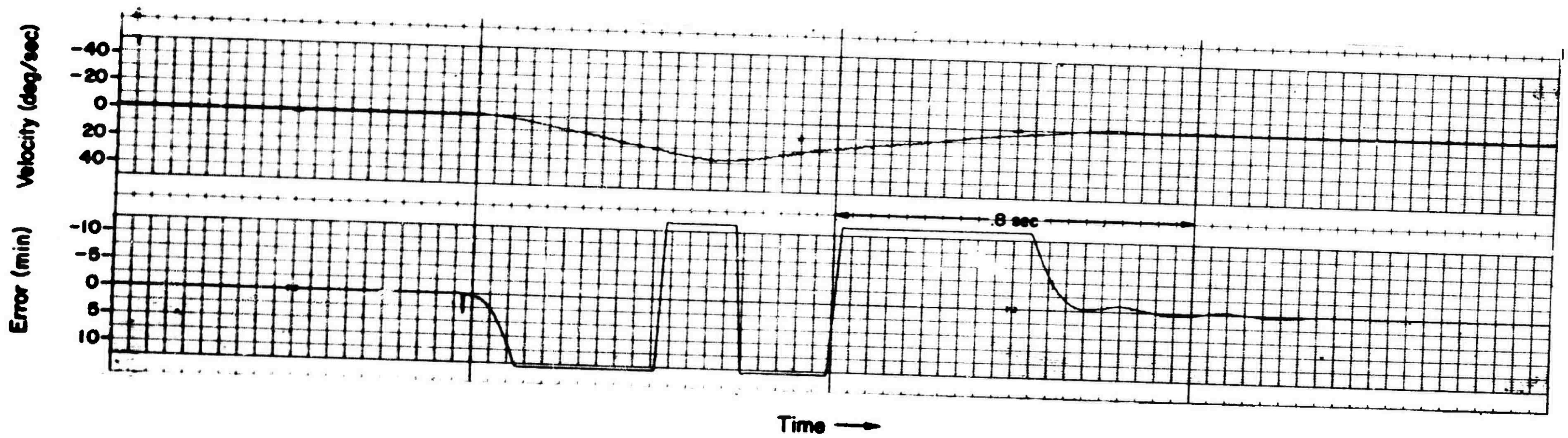


Figure 14. Synchronizing Time Test, stationary input signal 20° to the left.

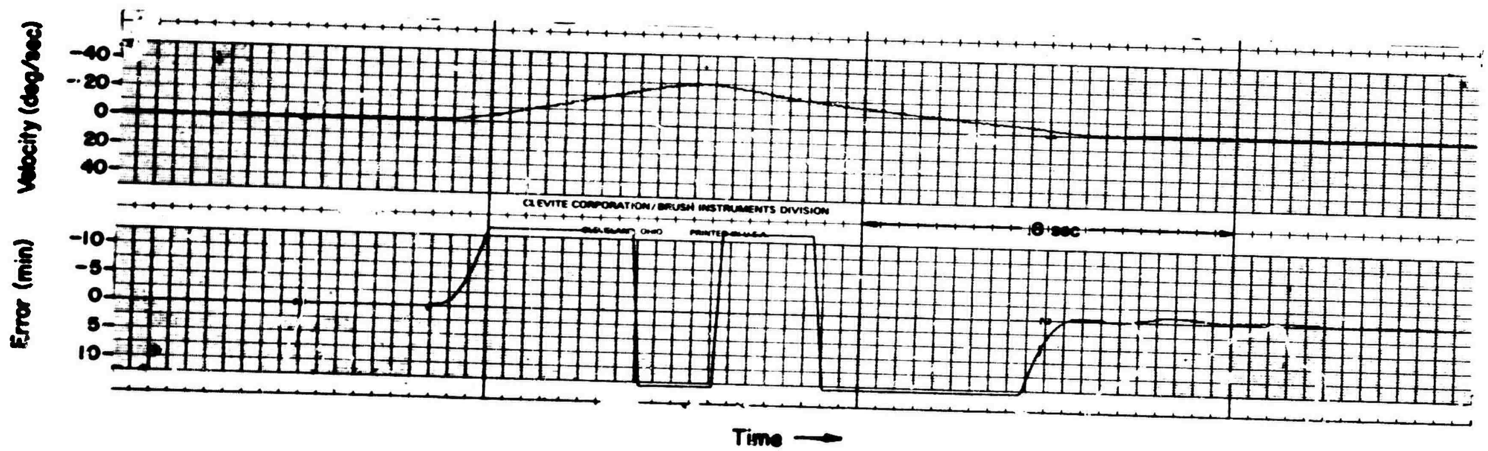


Figure 15. Synchronizing Time Test, stationary input signal 45° to the right.

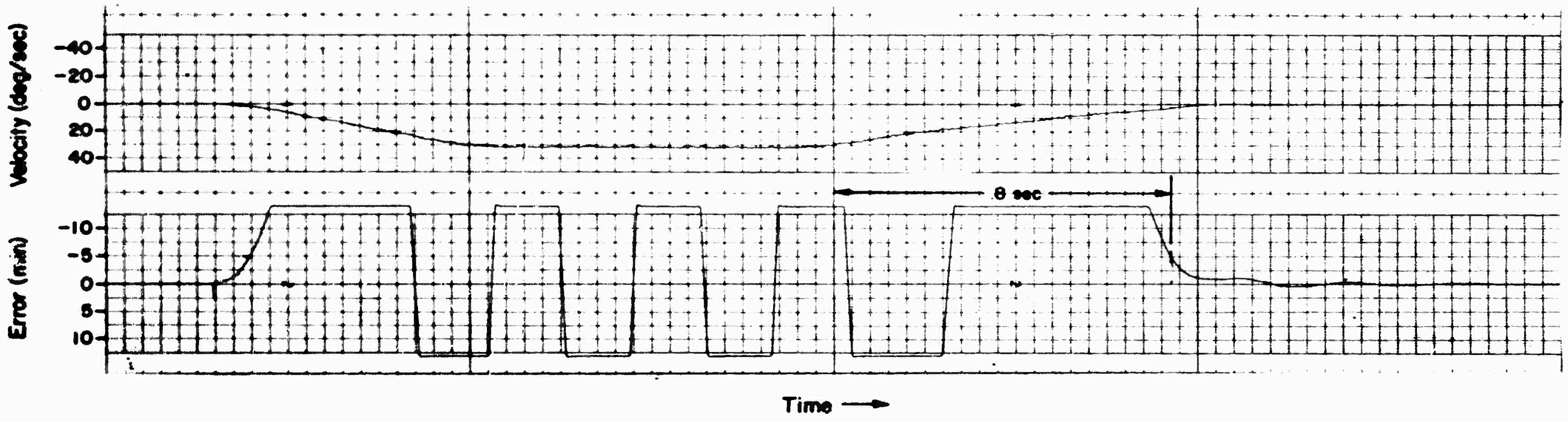


Figure 16. Synchronizing Time Test, stationary input signal 45° to the left.

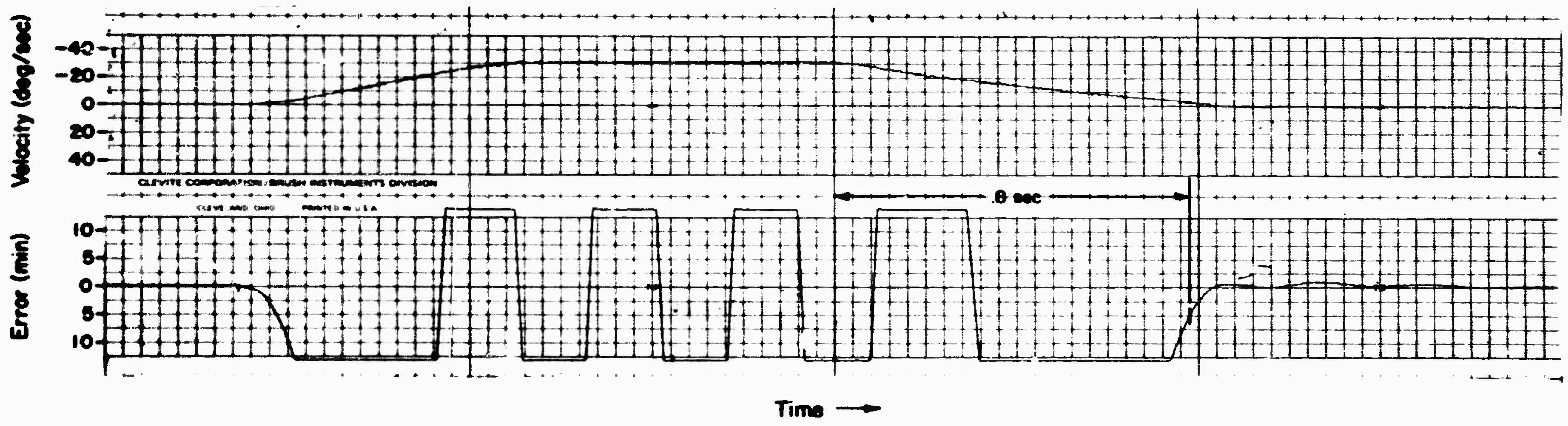


Figure 17 Synchronizing Time Test, stationary input signal 90° to the right.

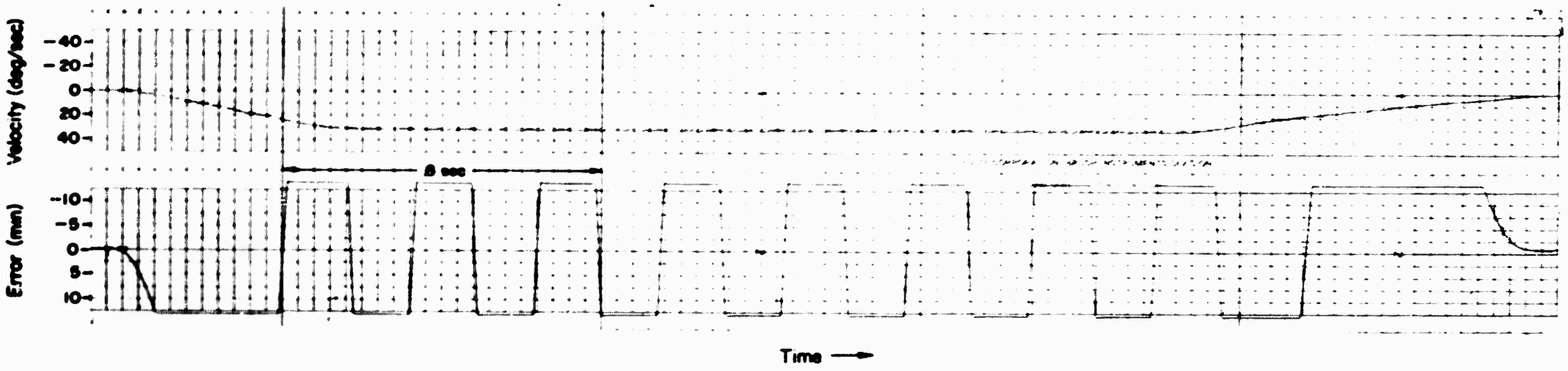


Figure 18 Synchronizing Time Test, stationary input signal 90° to the left.

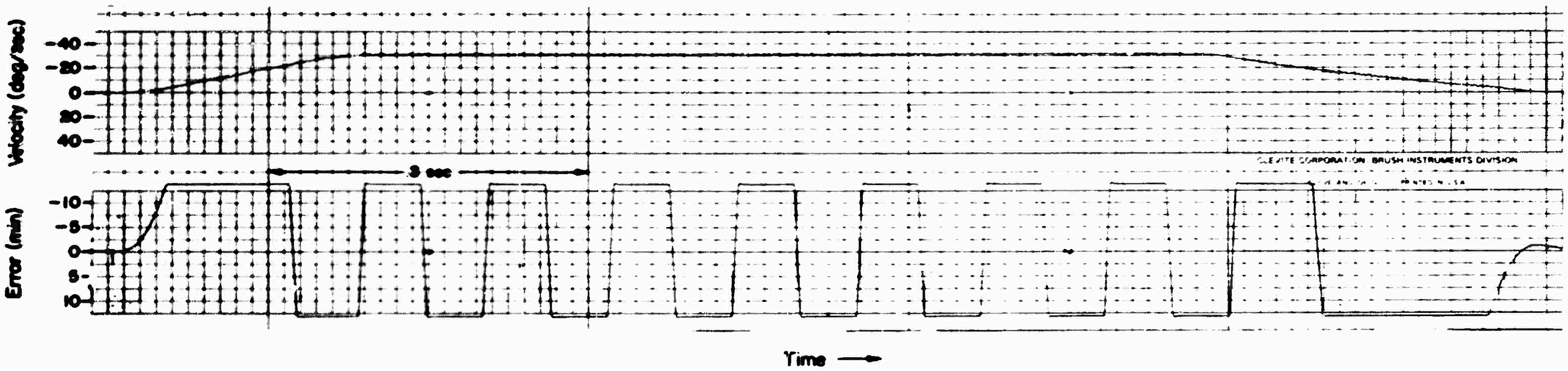


Figure 19. Synchronizing Time Test, constant velocity input signal of 5°/sec, initial error of 0°

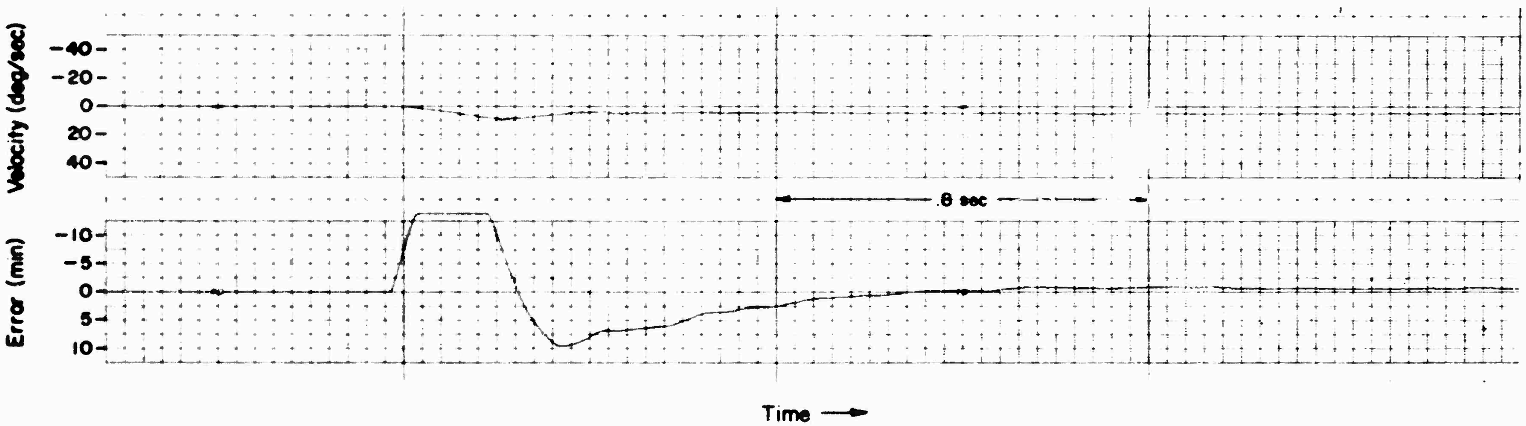


Figure 20. Synchronizing Time Test, constant velocity input signal departing gun position of 5°/sec, initial error of −60° (mount trains to the right to synchronize, then trains to the right at constant velocity).

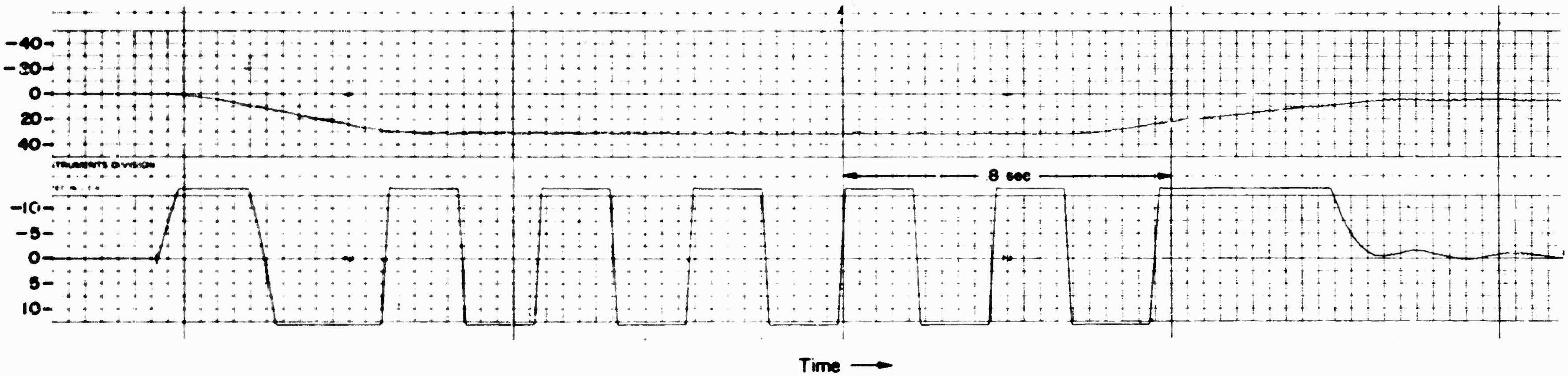


Figure 21. Synchronizing Time Test, constant velocity input signal of 10°/sec, initial error of 0°.

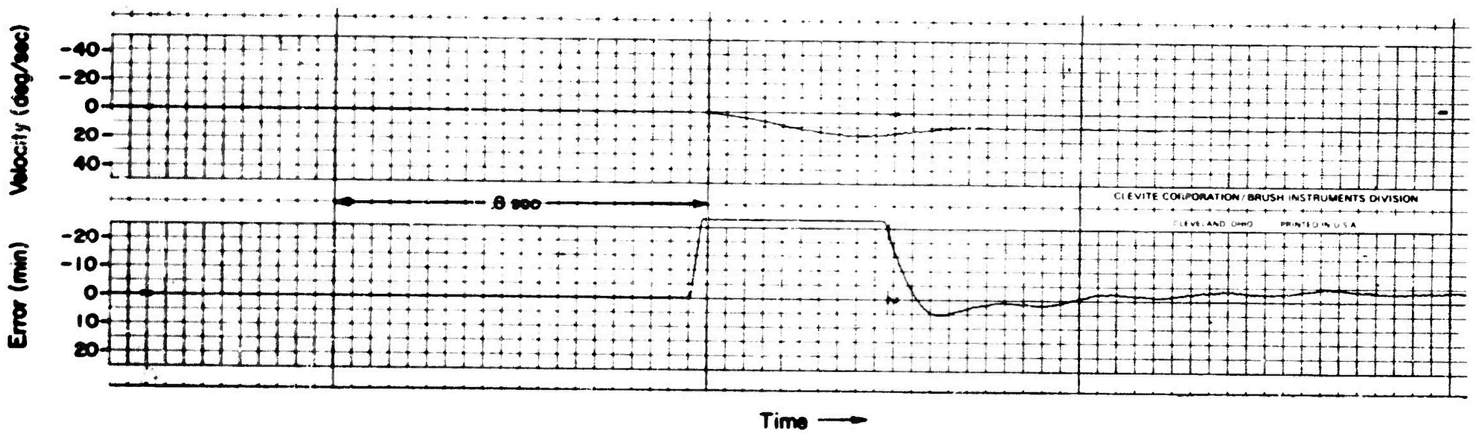


Figure 22. Synchronizing Time Test, constant velocity input signal approaching gun position of 5°/sec, initial error of 60° (mount trains to the left to synchronize, then trains to the right).

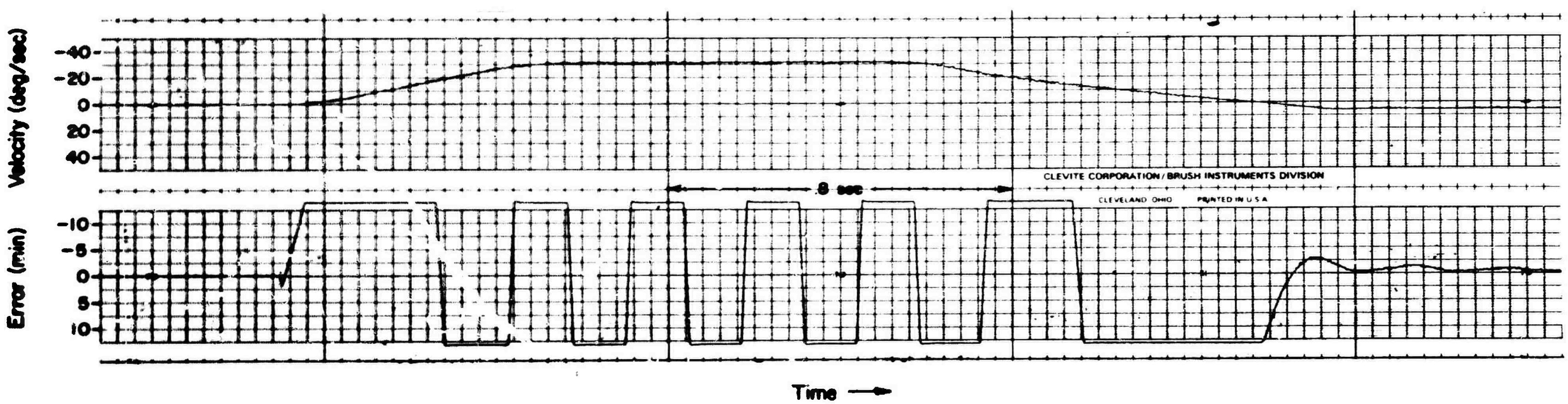


Figure 23. Synchronizing Time Test, constant velocity input signal approaching gun position of 10°/sec, initial error of 60° (mount trains to the left to synchronize, then trains to the right).

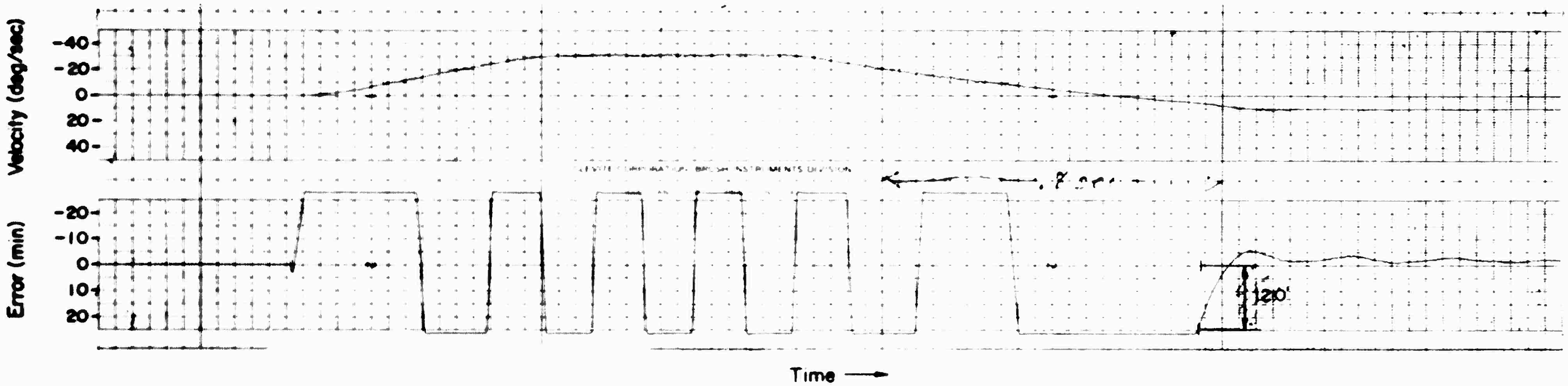


Figure 24. Synchro Power Failure Test, stationary input signals. Fixed point to a fixed point to the right. Pip on position trace indicates interruption of synchro power.

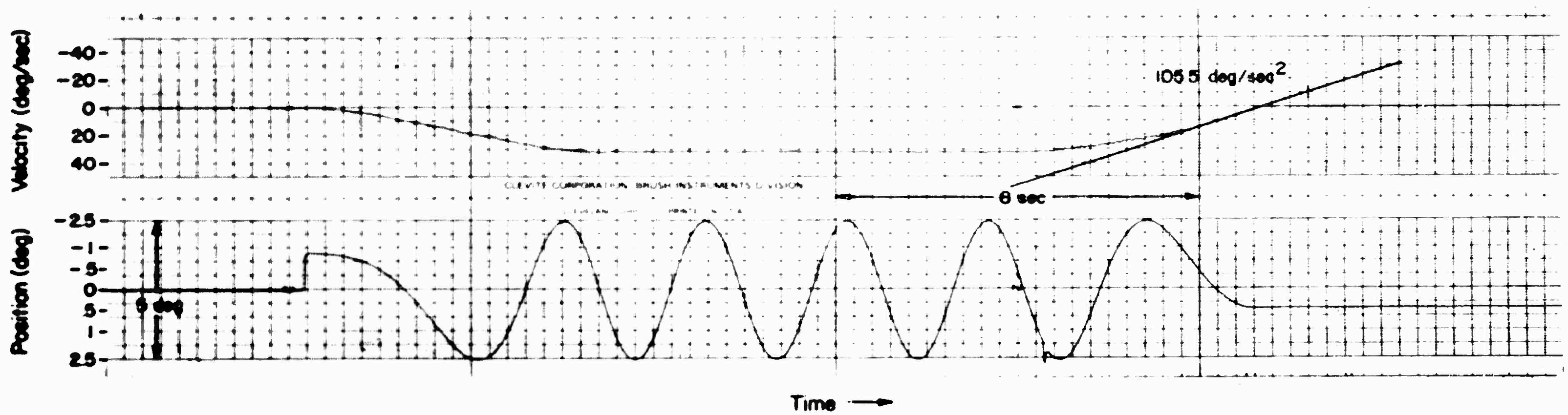


Figure 25. Synchro Power Failure Test, stationary input signals. Fixed point to a fixed point to the left. Pip on position trace indicates interruption of synchro power.

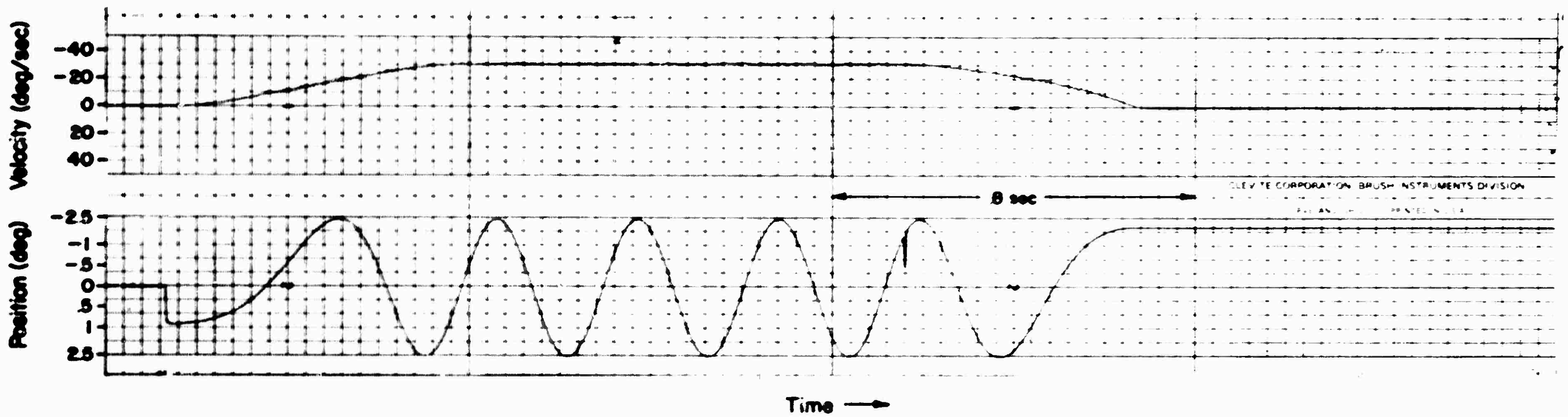


Figure 26. Limit Stop Test, constant velocity input signal of 15°/sec (trained into right limit stop).

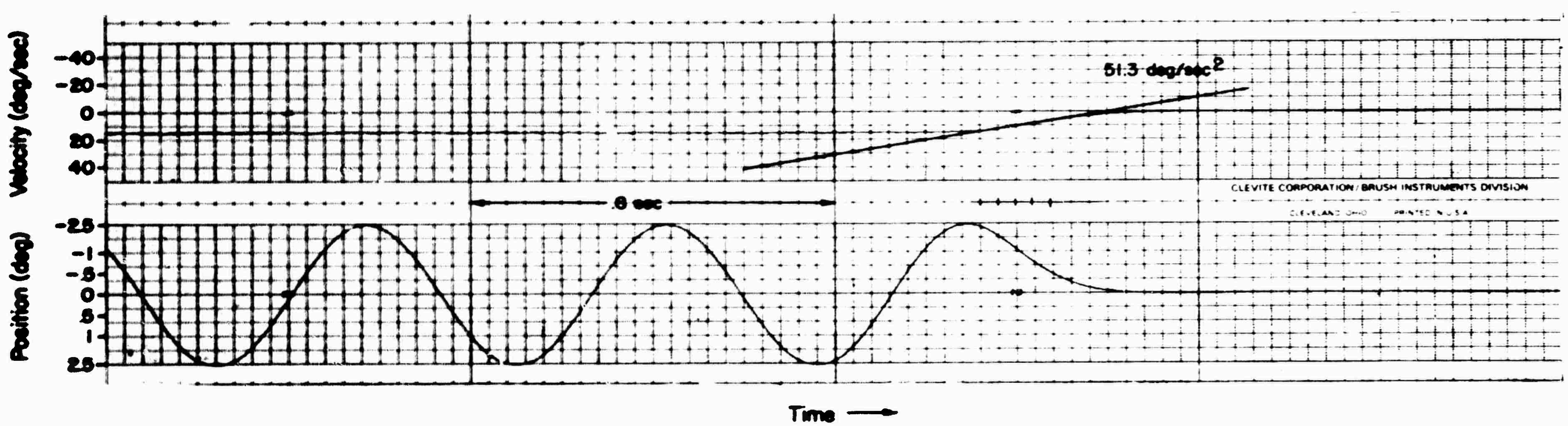


Figure 27. Limit Stop Test, constant velocity input signal of $-15°/sec$ (trained into left limit stop).

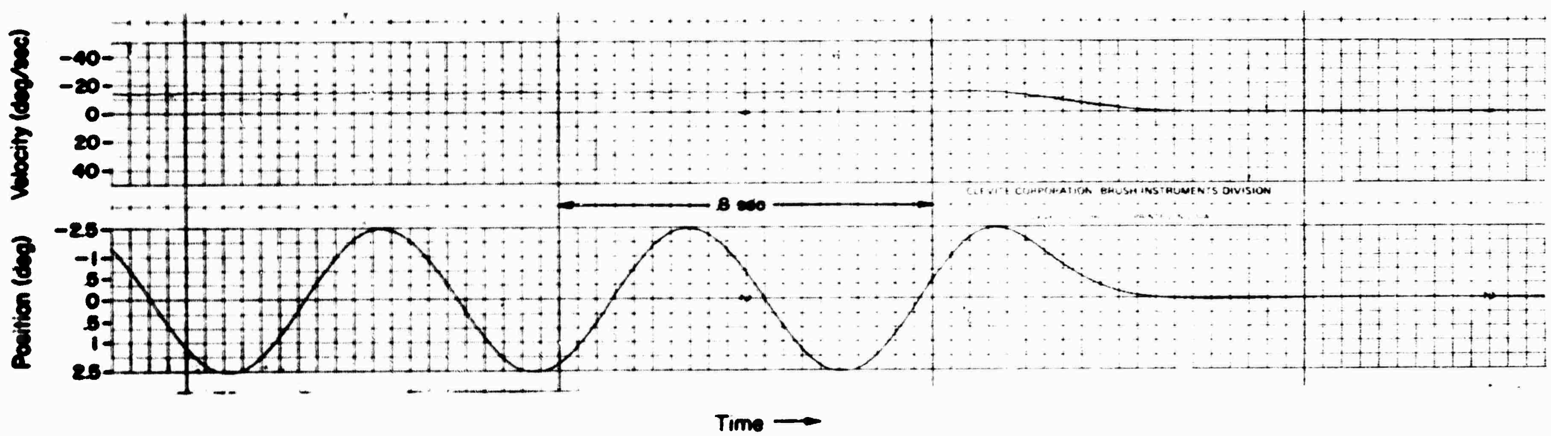


Figure 28. Limit Stop Test, stationary input signals: Fixed point to a point to the right beyond the right limit stop (trained into right limit stop at maximum velocity).

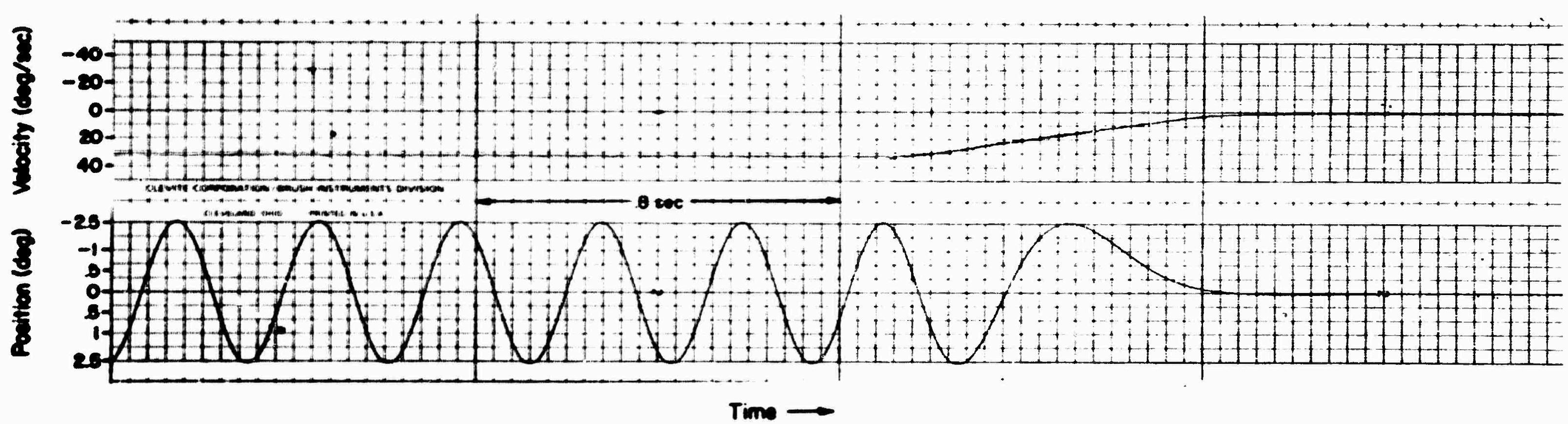


Figure 29. Limit Stop Test, stationary input signals: Fixed point to a point to the left beyond the left limit stop (trained into left limit stop at maximum velocity).

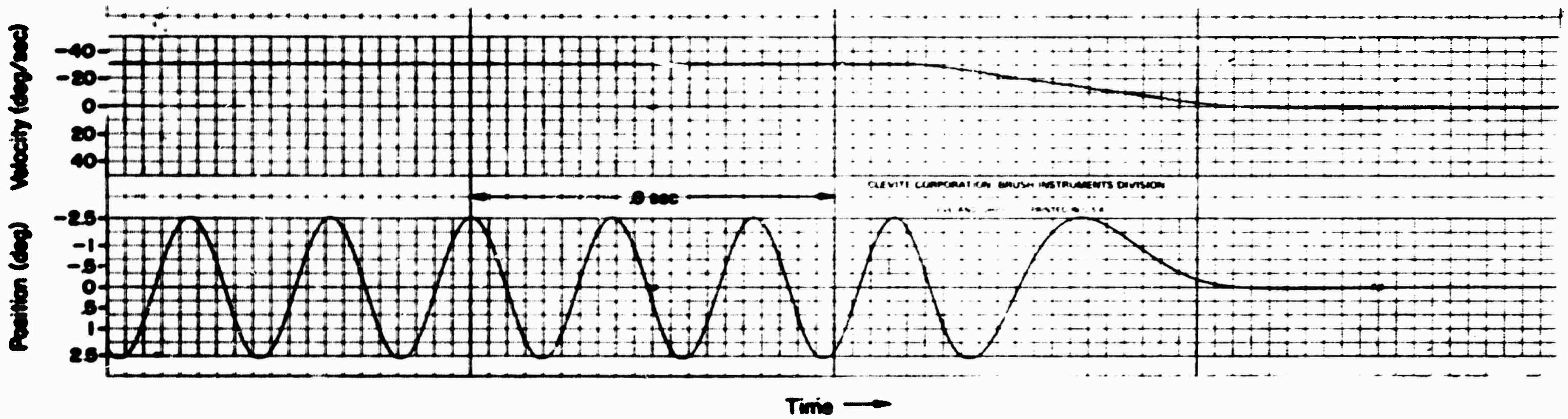


Figure 30. Limit Stop Test, constant velocity input signal of 15°/sec (trained out of left limit stop).

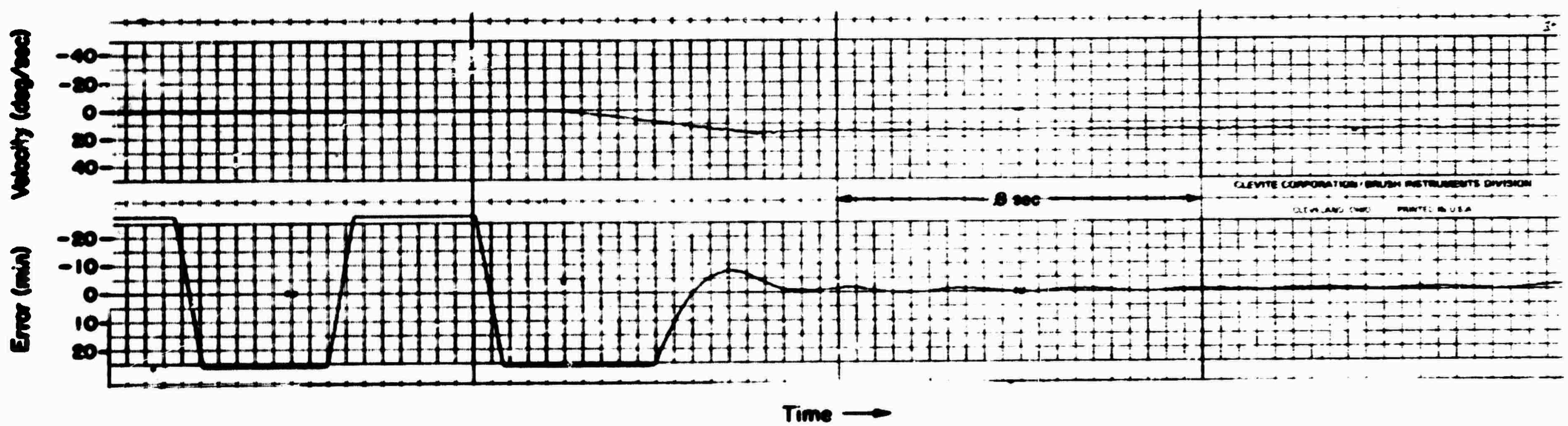


Figure 31. Limit Stop Test, constant velocity input signal of −15°/sec (trained out of right limit stop).

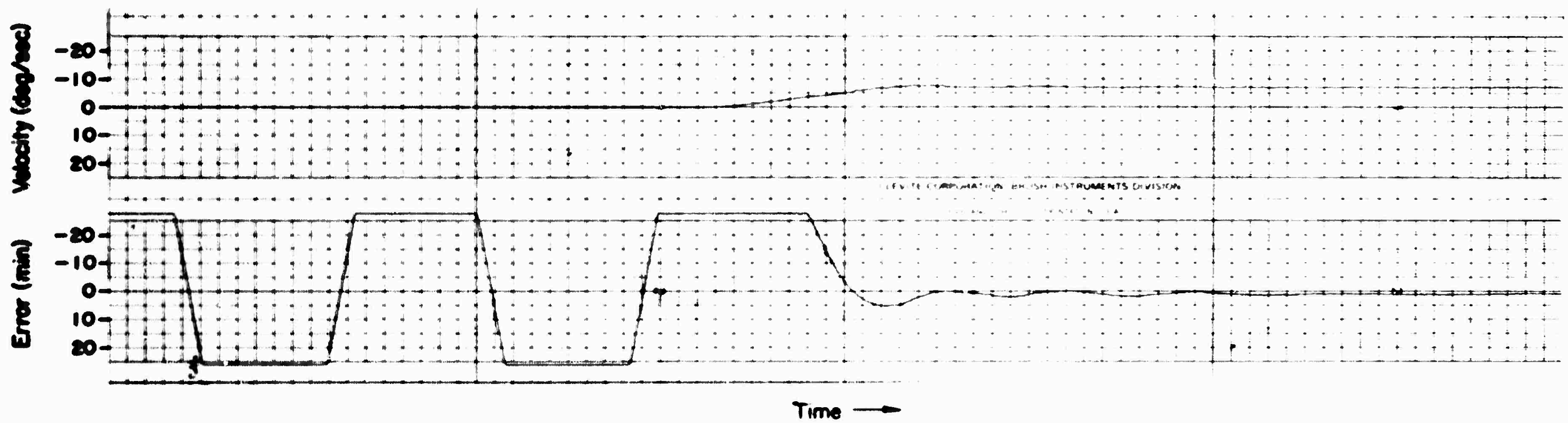


Figure 32. Emergency Limit Stop Test, constant velocity input 15°/sec (trained into right emergency limit stop).

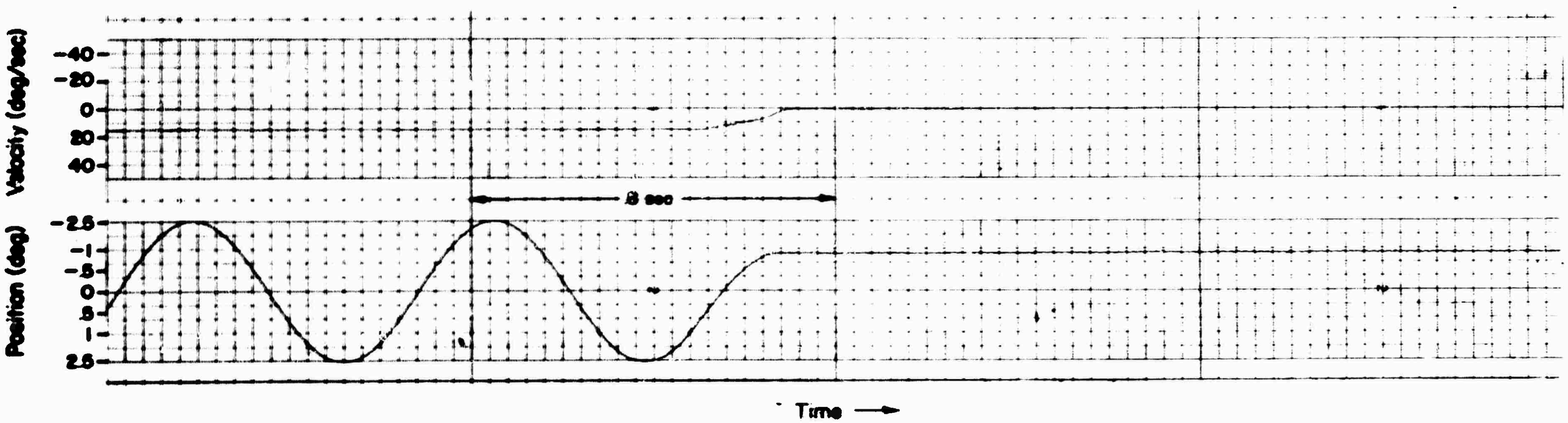


Figure 33. Emergency Limit Stop Test, constant velocity input signal of −15°/sec (trained into left emergency limit stop).

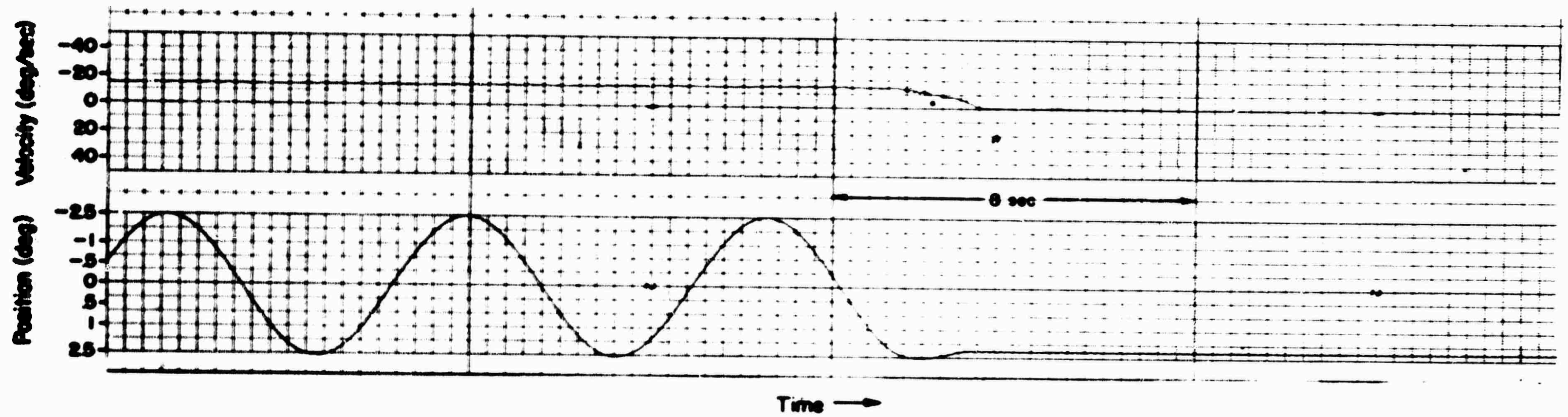


Figure 34. Emergency Limit Stop Test, stationary input signals: Fixed point to a point to the right beyond the right emergency limit stop (trained into right emergency limit stop at maximum velocity).

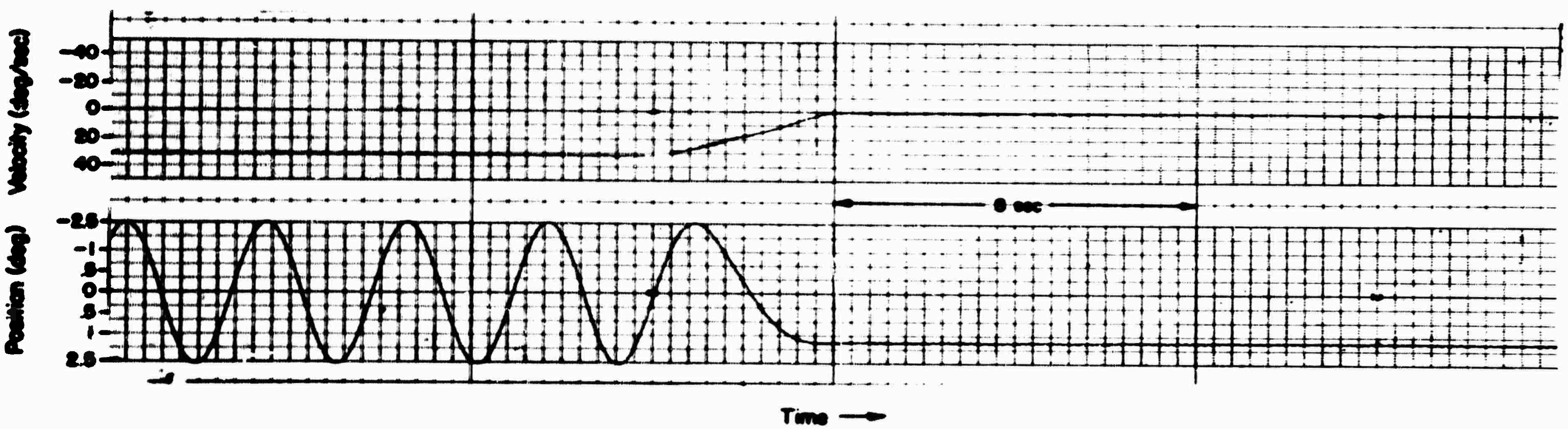


Figure 35 Emergency Limit Stop Test, stationary input signals. Fixed point to a point to the left beyond the left emergency limit stop (trained into left emergency limit stop at maximum velocity)

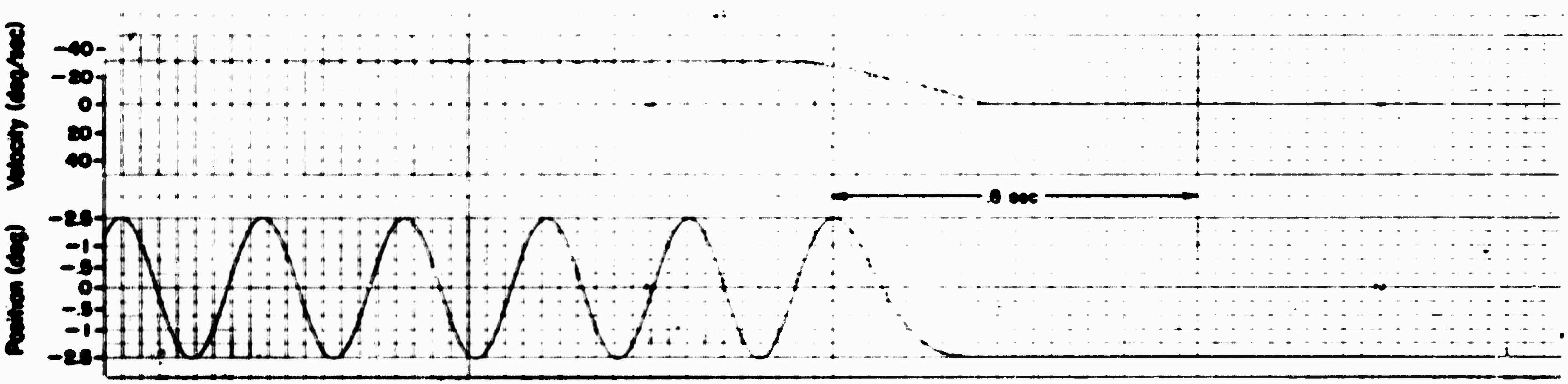


Figure 36. Frequency Response Test, SHM input of 3' amplitude, 0.23 Hz frequency

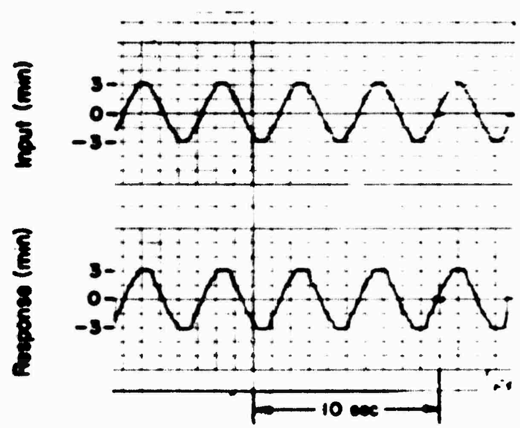


Figure 37. Frequency Response Test, SHM input of 3' amplitude, 0.48 Hz frequency.

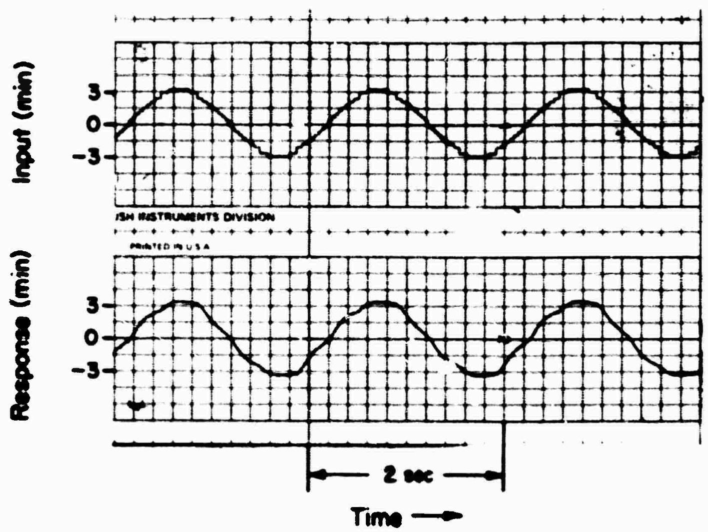


Figure 38. Frequency Response Test, SHM input of 3' amplitude, 0.68 Hz frequency.

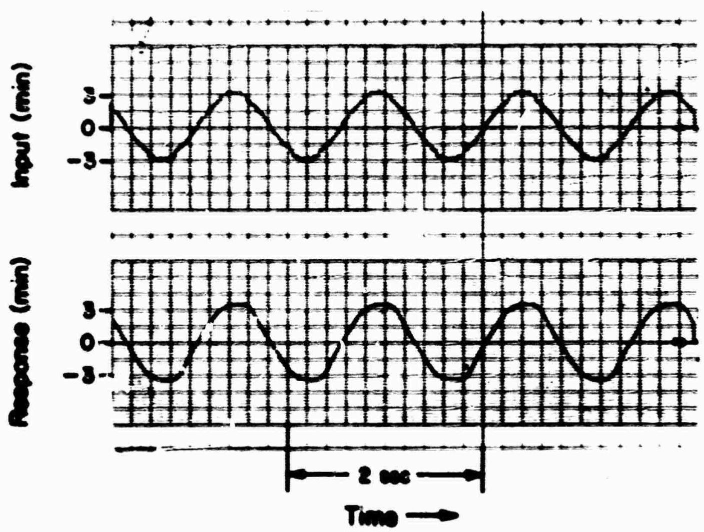


Figure 39. Frequency Response Test, SHM input of 3' amplitude, 0.89 Hz frequency.

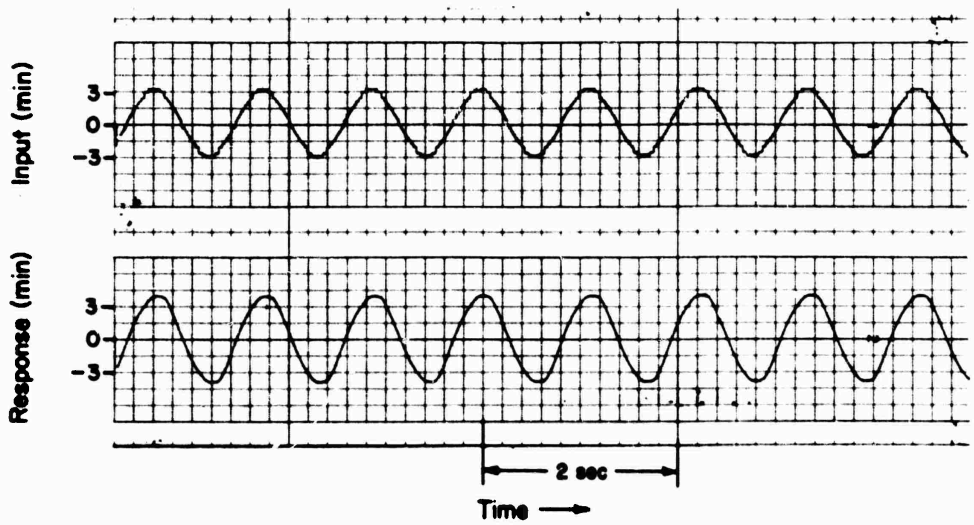


Figure 40. Frequency Response Test, SHM input of 3' amplitude, 1.4 Hz frequency.

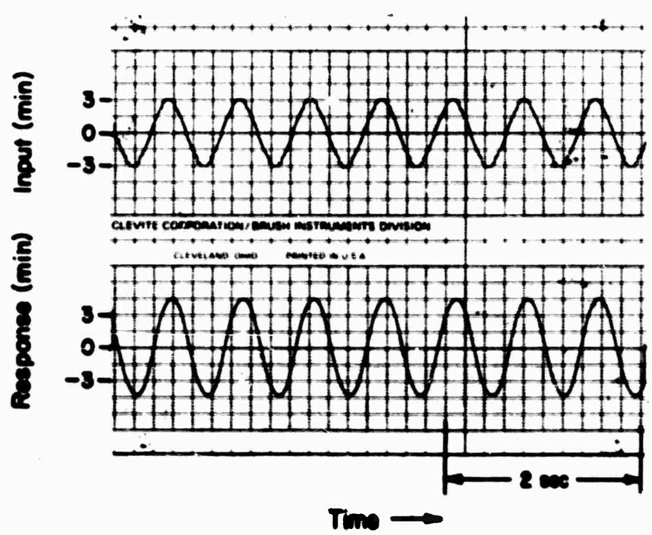


Figure 41. Frequency Response Test, SHM input of 3' amplitude, 2.0Hz frequency.

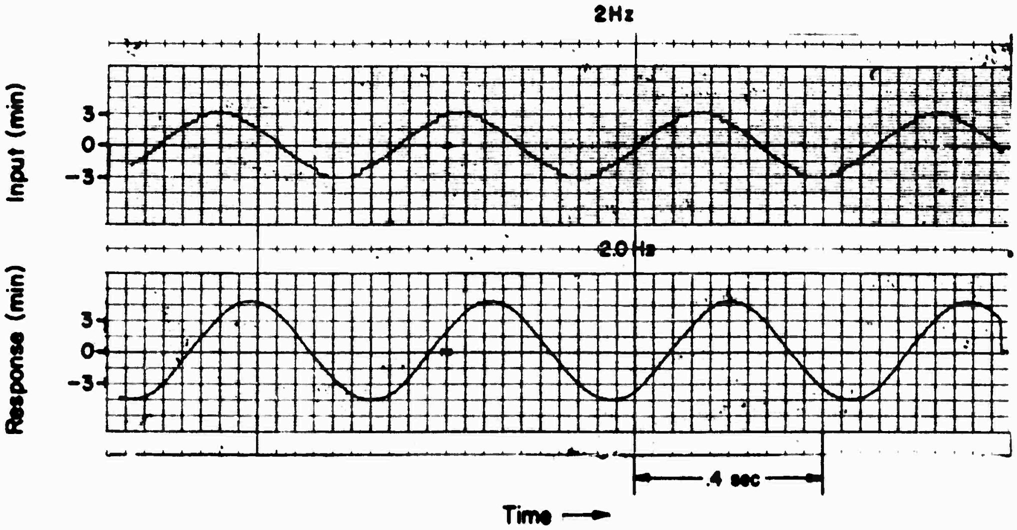


Figure 42. Frequency Response Test, SHM input of 3' amplitude, 2.8Hz frequency.

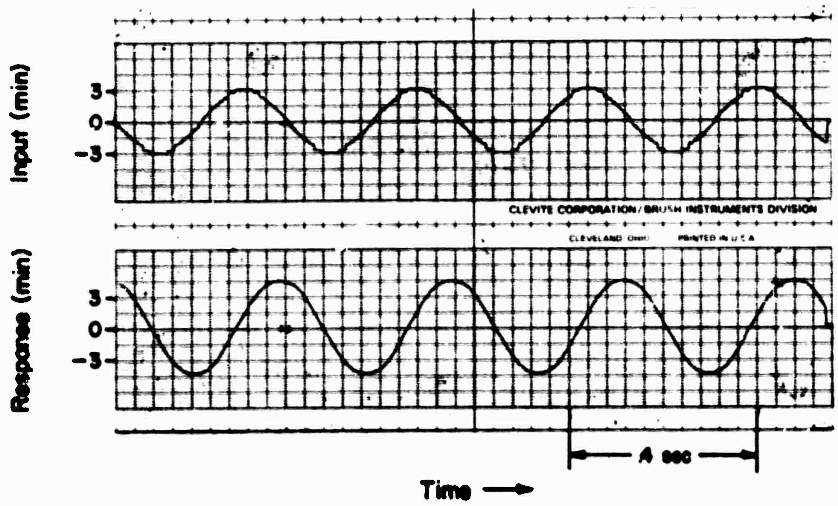


Figure 43. Frequency Response Test, SHM input of 3' amplitude, 3.6Hz frequency.

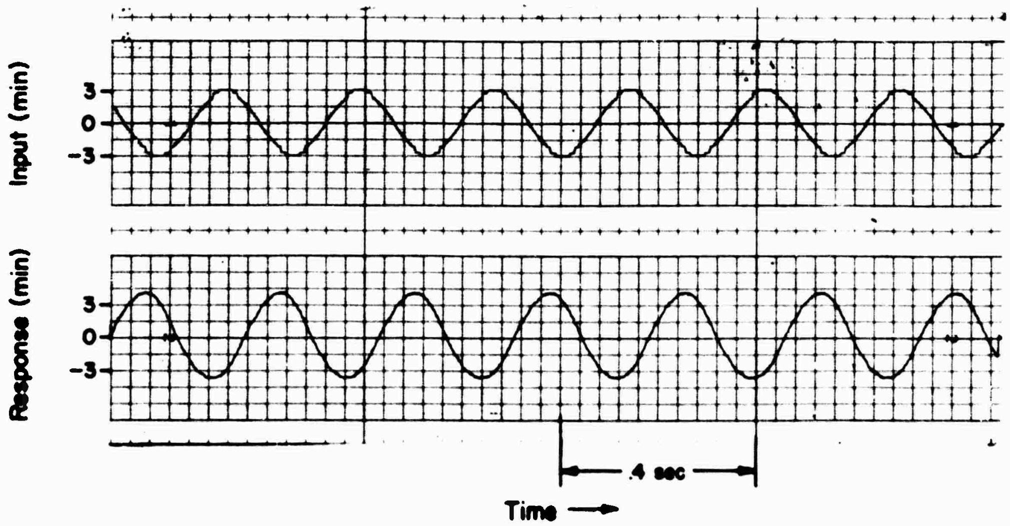


Figure 44. Frequency Response Test, SHM input of 3' amplitude, 3.9Hz frequency.

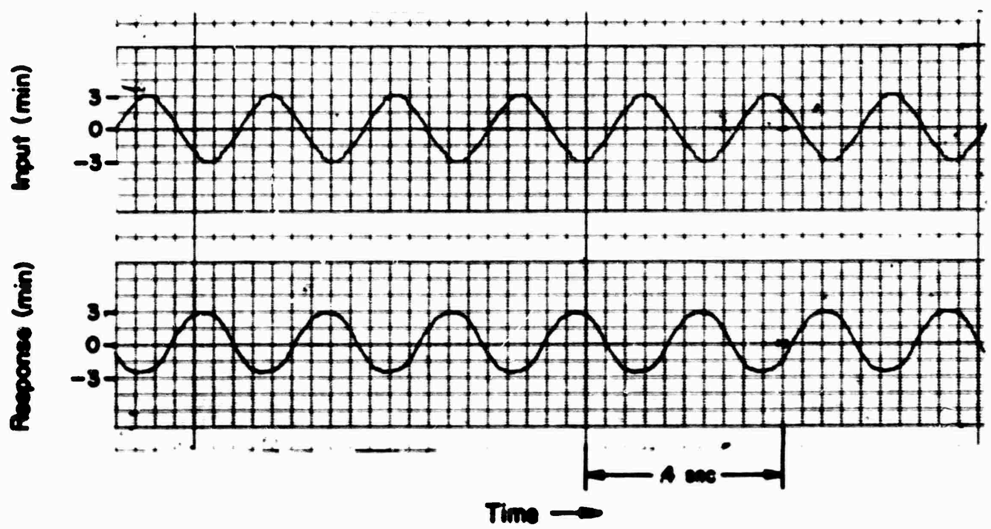


Figure 45. Frequency Response Test, SHM input of 3' amplitude, 5.3Hz frequency.

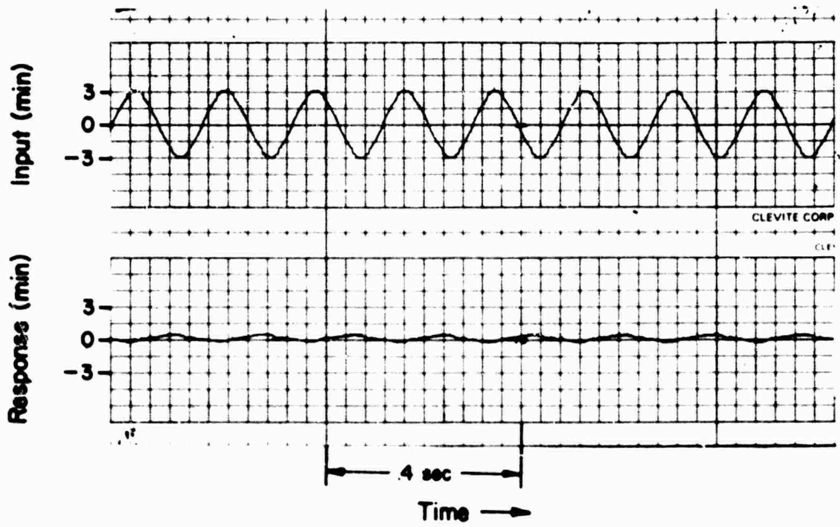


Figure 46. Frequency Response Test, SHM input of 3' amplitude, 7.4 Hz frequency.

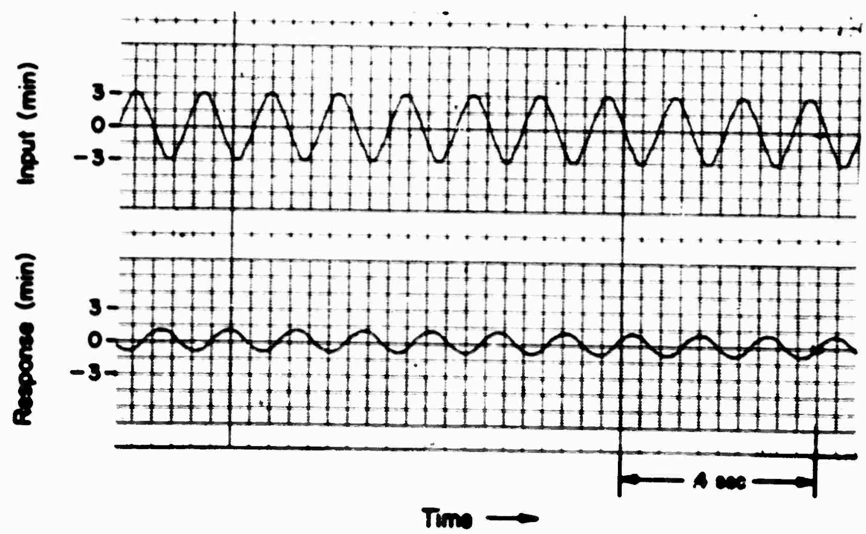
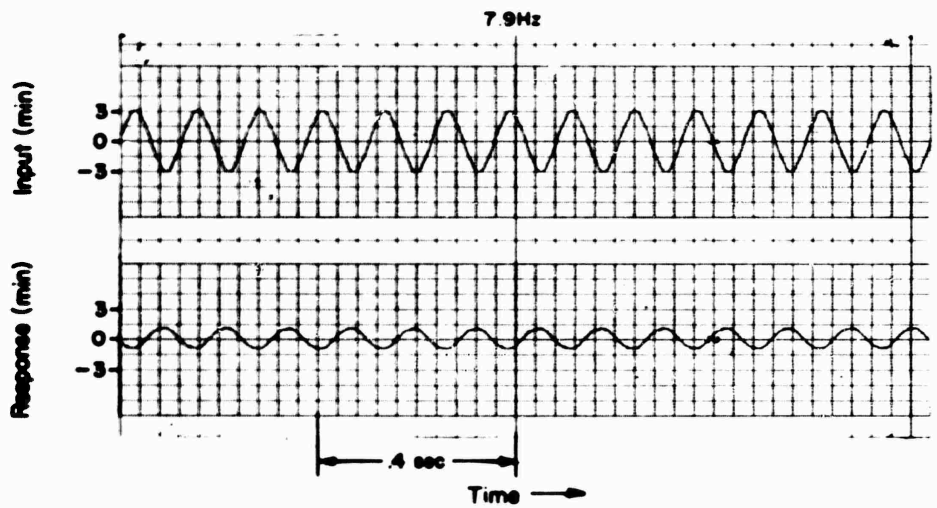


Figure 47. Frequency Response Test, SHM input of 3' amplitude, 7.9Hz frequency.



APPENDIX E

Elevation Power Drive Test Data
Table E-1
Figures 1 Through 50

TABLE E-1

8"/55 MCLGM TECHNICAL EVALUATION ELEVATION POWER DRIVE TEST DATA

ACCURACY TESTS

Figure Number	Input Signal	Error (min)
	Stationary	
1	2000′ (0 deg)	0.1
1	3000′ (16.67 deg)	0.5
2	4000′ (33.33 deg)	0.3
2	5000′ (50.00 deg)	0.1
	Constant Velocity	
3	5°/sec	0.6
3	-5°/sec	1.0
4	10°/sec	1.0
4	-10°/sec	1.2
5	15°/sec	1.0
5	-15°/sec	2.0
	Simple Harmonic Motion (Amplitude-Period)	
6	5°-4.5 sec	1.75
7	10°-4.5 sec	1.75
8	5°-9 sec	0.75
9	10°-9 sec	1.25
10	15°-9 sec	1.75
11	20°-9 sec	1.50

MAXIMUM VELOCITY AND ACCELERATION TESTS

Figure Number	Maximum Velocity (deg/sec)	Maximum Acceleration (deg/sec^2)
12	20.3	-41.4
13	-21.1	41.4

TABLE E-1 (Continued)

SYNCHRONIZING TIME TESTS

Figure Number	Input Signals Order[1]	Order[2]	Initial Error (deg)	Gun Motion Induced	Synchronizing Time (sec)
14	Stationary	Stationary	-5	Elevate	0.78
15	Stationary	Stationary	+5	Depress	0.78
16	Stationary	Stationary	-20	Elevate	1.64
17	Stationary	Stationary	+20	Depress	1.63
18	Stationary	Stationary	-45	Elevate	2.78
19	Stationary	Stationary	+45	Depress	2.76
20	Stationary	C.V. 5°/sec	0	Elevate	0.68
21	Stationary	C.V. 5°/sec	+30	Depress then Elevate	1.88
22	Stationary	C.V. 5°/sec	-60	Elevate	2.45
23	Stationary	C.V. 5°/sec	+60	Depress then Elevate	2.78
24	Stationary	C.V. 10°/sec	+30	Depress then Elevate	1.79
25	Stationary	C.V. 10°/sec	0	Elevate	0.56
26	Stationary	C.V. 10°/sec	+60	Depress then Elevate	2.72
27	Stationary	C.V. 10°/sec	+90	Depress then Elevate	3.84

SYNCHRO POWER FAILURE TESTS

Figure Number	Mount Motion	Maximum Deceleration (deg/sec^2)	Distance Traveled After Failure (From Dials)
28	Elevate	108	6°6′
29	Depress	100	6°18′

LIMIT STOP TESTS

Figure Number	Gun Motion Into Stop Direction	Velocity	Maximum Deceleration (deg/sec^2)
30	Elevate	+10°/sec	25
31	Depress	-10°/sec	25
32	Elevate	Maximum	27.8
33	Depress	Maximum	31.6

TABLE E-1 (Continued)

Figure Number	Mount Order	Gun Motion Out of Stop	Synchronizing Time (sec)
34	Constant Velocity of 10°/sec	Elevate	0.23
35	Constant Velocity of -10°/sec	Depress	0.28

EMERGENCY LIMIT STOP TESTS

Figure Number	Gun Motion Into Stop Direction	Gun Motion Into Stop Velocity	Maximum Deceleration (deg/sec^2)	Distance Before Setting Gun Stopped (From Dials)
36	Elevate	10°/sec	79	3°26′
37	Depress	-10°/sec	75	3°16′
38	Elevate	Maximum	92	4°0′
39	Depress	Maximum	80	3°59′

Gun stopped position when driven into each actual emergency limit stop at a constant velocity of 1°/sec.

Depression	Elevation
-5° 25′	65° 21′

FREQUENCY RESPONSE TESTS

Figure Number	SHM Input Signal Frequency (Hz)	Amplitude Ratio Output/Input	Approximate Phase Angle (deg)
40	0.24	1.075	1.76
41	0.49	1.15	1.80
42	0.68	1.25	1.5
43	1.8	1.48	46.5
44	2.0	1.45	53.0
45	2.5	1.30	54.7
46	2.8	1.28	80.5
47	4.0	0.95	145
48	5.6	0.30	124
49	7.8	0.10	137

Figure 1. Accuracy Test, stationary input signal, gun elevated at 2000 min (0° 0' elevation from horizontal and 3000 min.

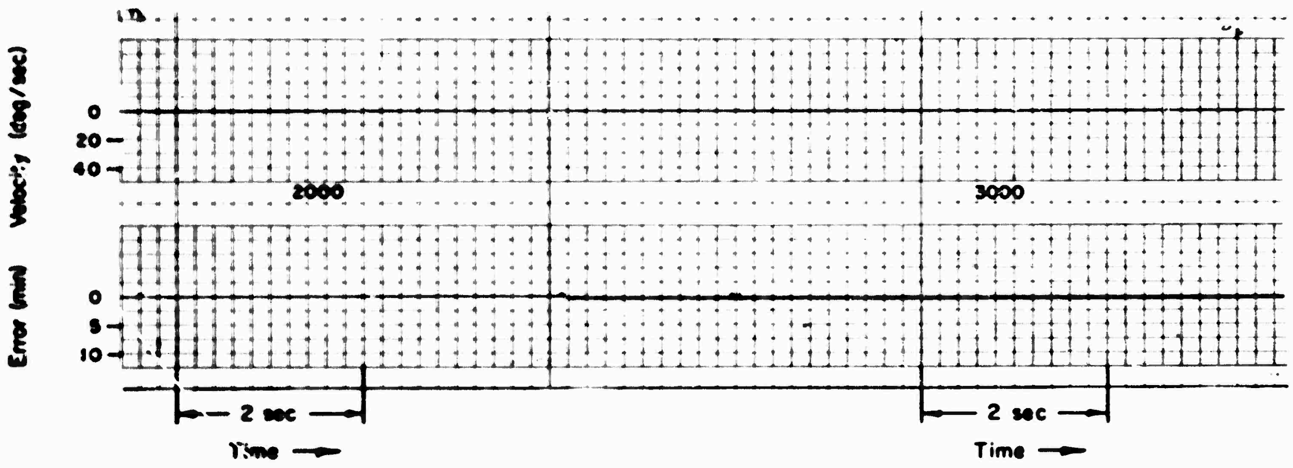


Figure 2. Accuracy Test, stationary input signal, gun elevated at 4000 min and 5000 min.

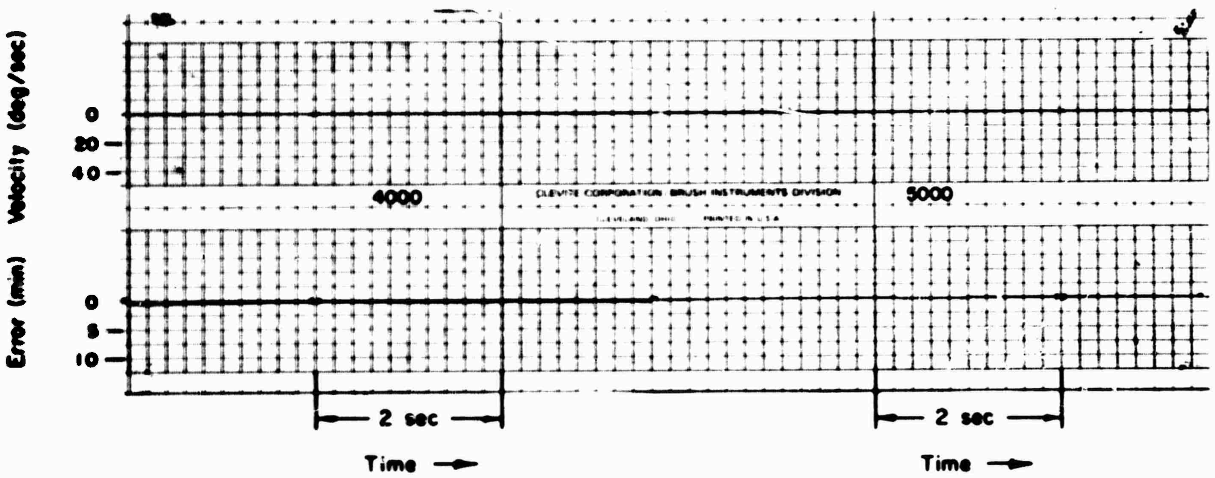


Figure 3. Accuracy Test, constant velocity input signals of 5°/sec (elevating) and −5°/sec (depressing).

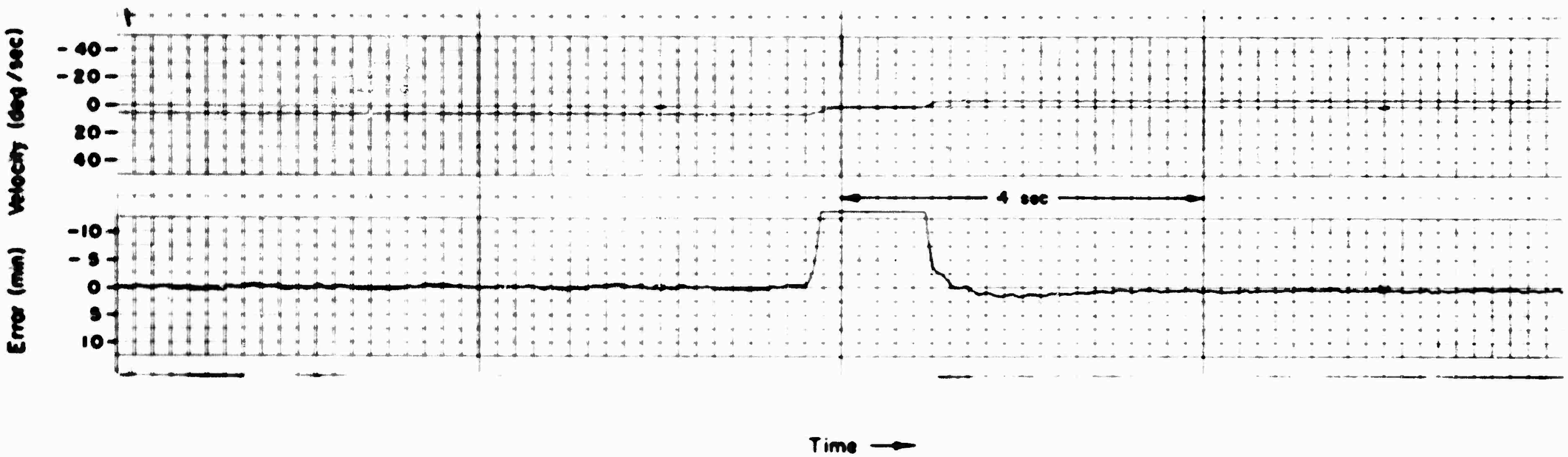


Figure 4. Accuracy Test, constant velocity input signals of 10°/sec and -10°/sec.

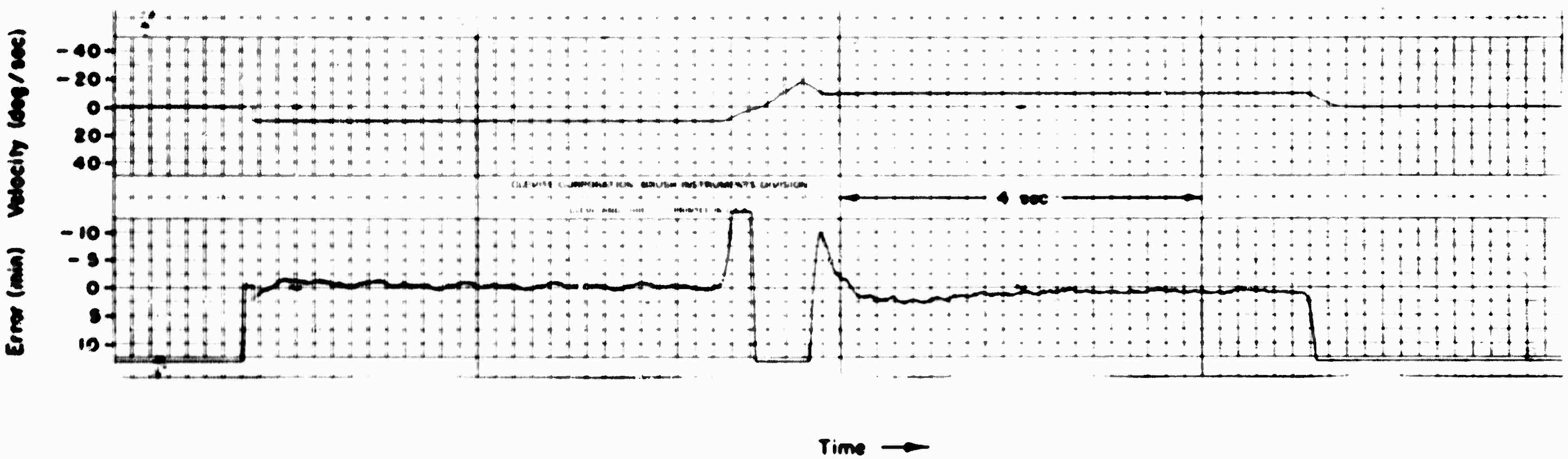


Figure 5. Accuracy Test, constant velocity input signals of 15°/sec and -15°/sec.

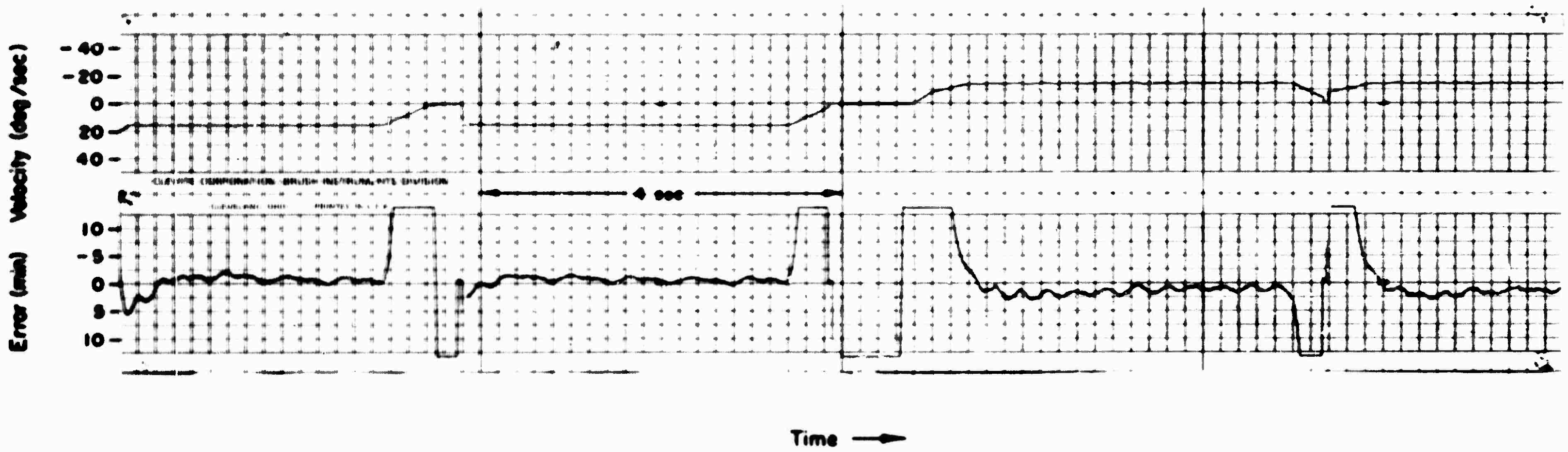


Figure 6. Accuracy Test, SHM input signal of 5° amplitude and 4.5 sec period.

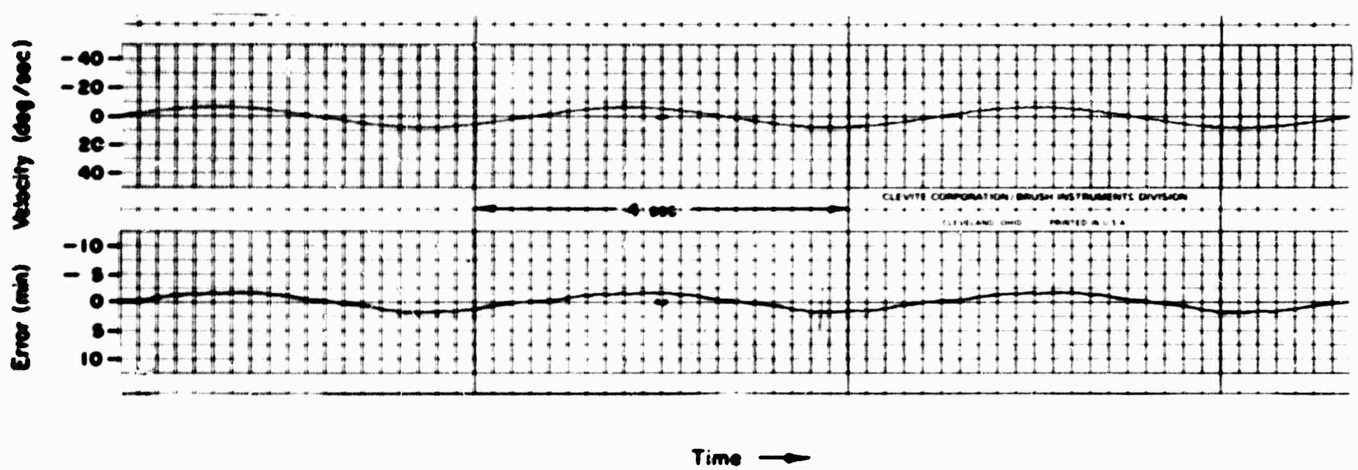


Figure 7. Accuracy Test, SHM input signal of 10° amplitude and 4.5 sec period.

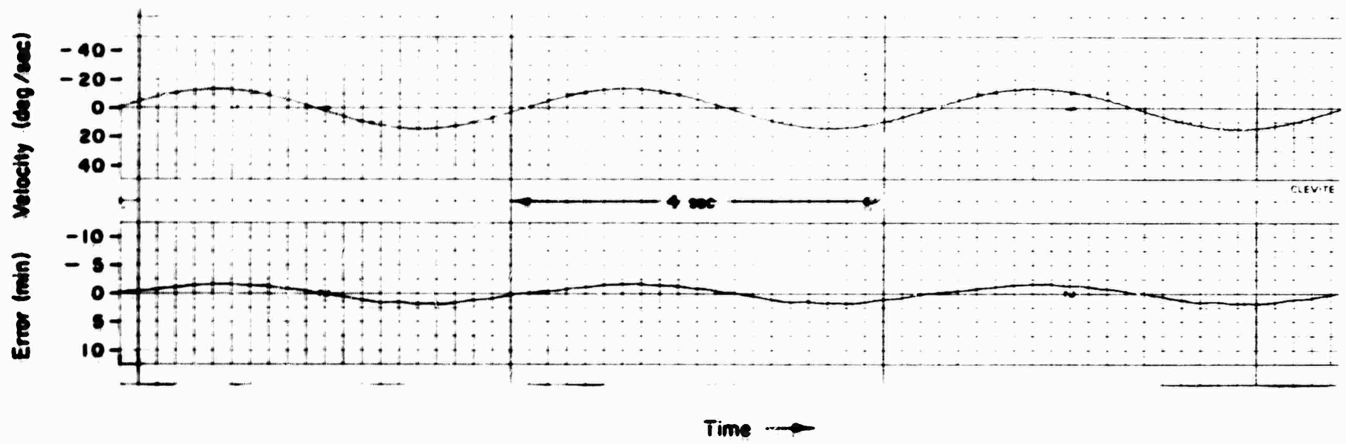


Figure 8. Accuracy Test, SHM input signul of 5° amplitude and 9 sec period.

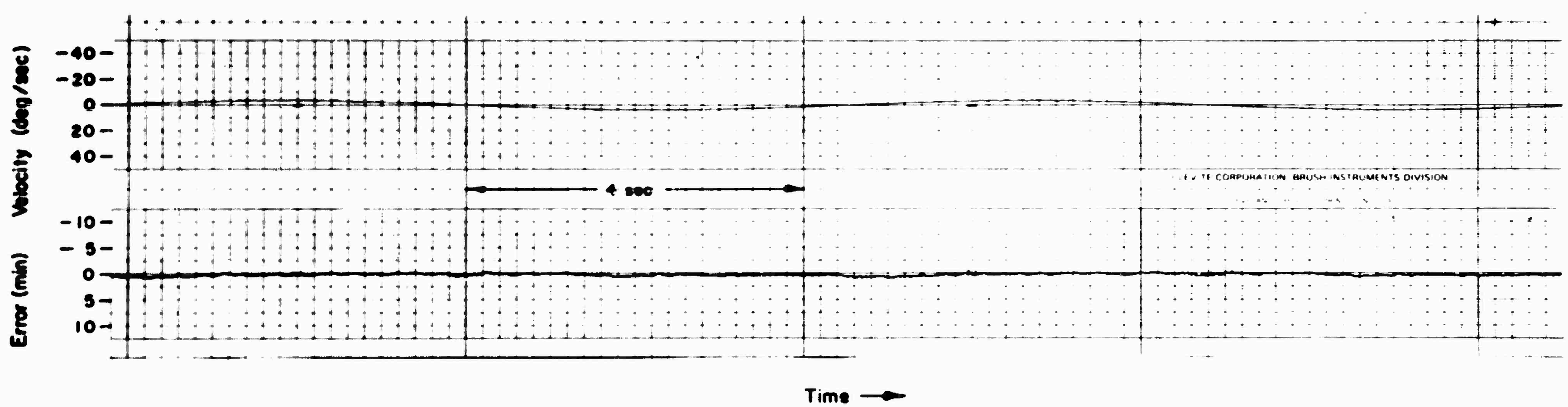


Figure 9. Accuracy Test, SHM Input signal of 10° amplitude and 9 sec period.

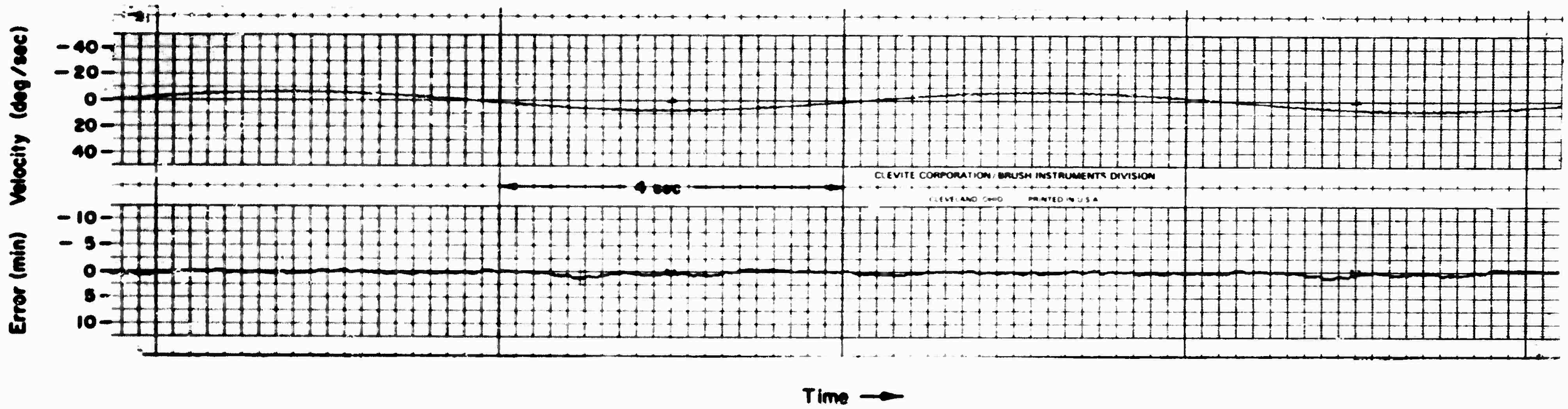


Figure 10. Accuracy Test, SHM Input signal of 15° amplitude and 9 sec period.

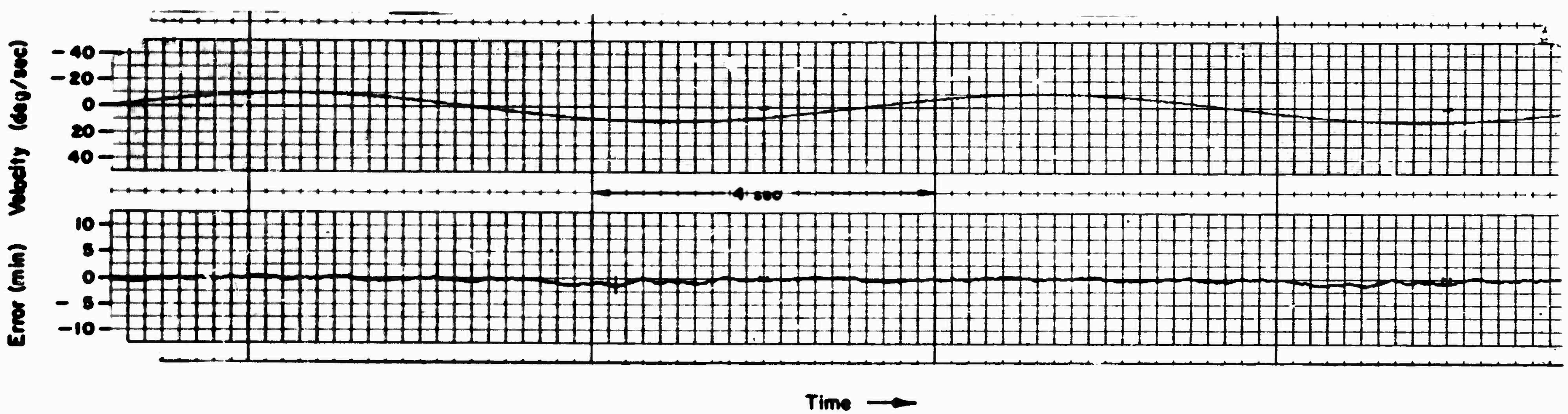


Figure 11. Accuracy Test, SHM input signal of 20° amplitude and 9 sec period.

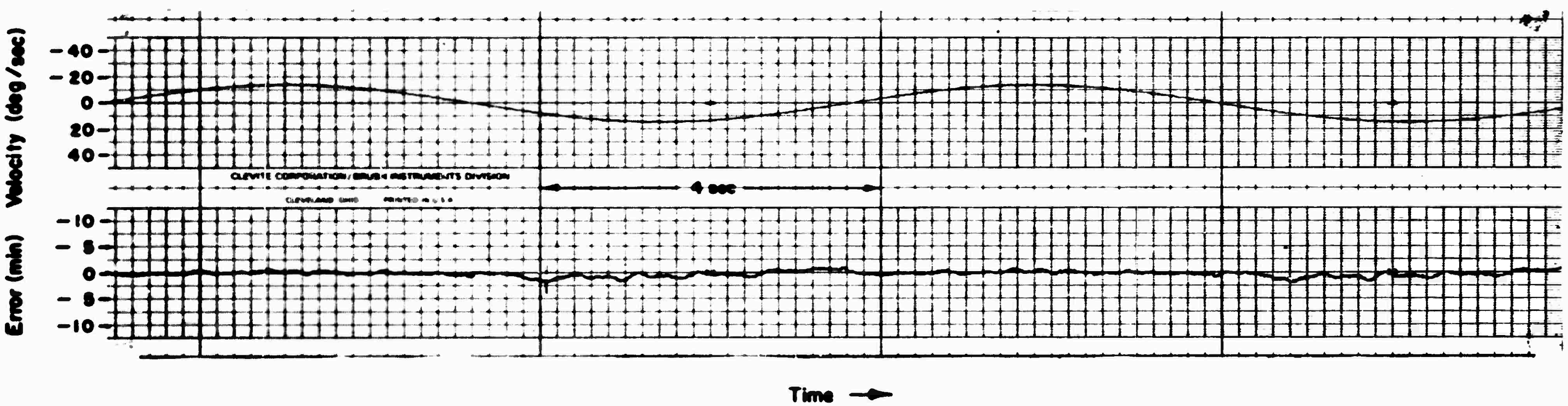


Figure 12. Maximum Velocity and Acceleration Test, stationary input signals : Fixed point to a higher fixed point and back (after maximum depressing velocity is reached) to the original point.

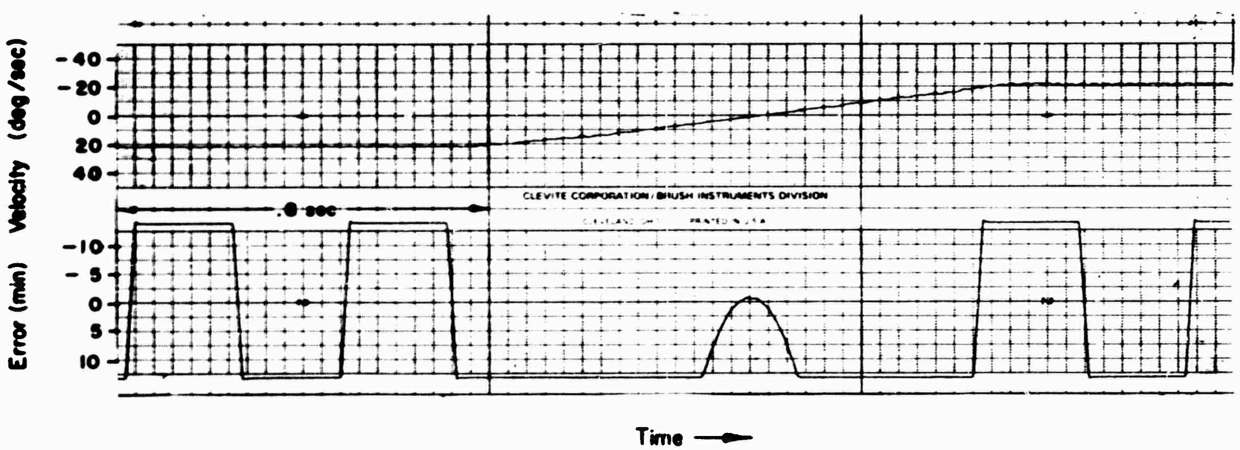


Figure 13. Maximum Velocity and Acceleration Test, stationary input signals: Fixed point to lower fixed point and back (after maximum depressing velocity is reached) to the original point.

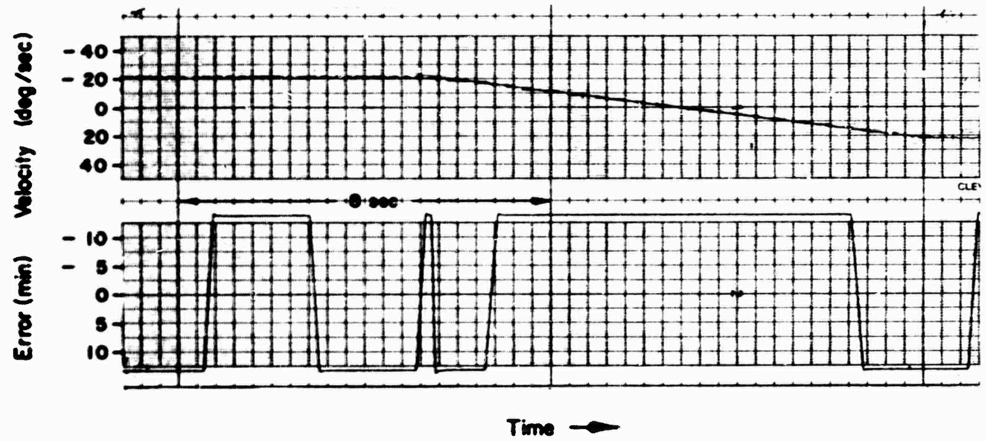


Figure 14. Synchronizing Time Test, stationary input signal 5° high (gun elevates).

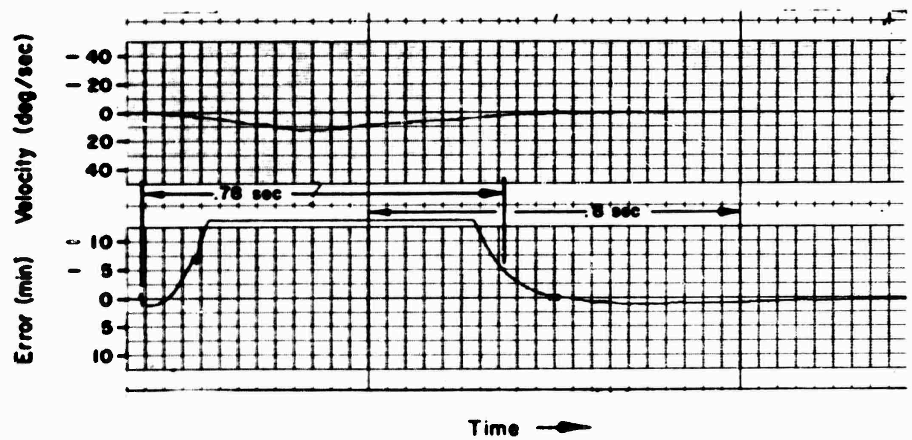


Figure 15. Synchronizing Time Test, stationary input signal 5° low (gun depresses).

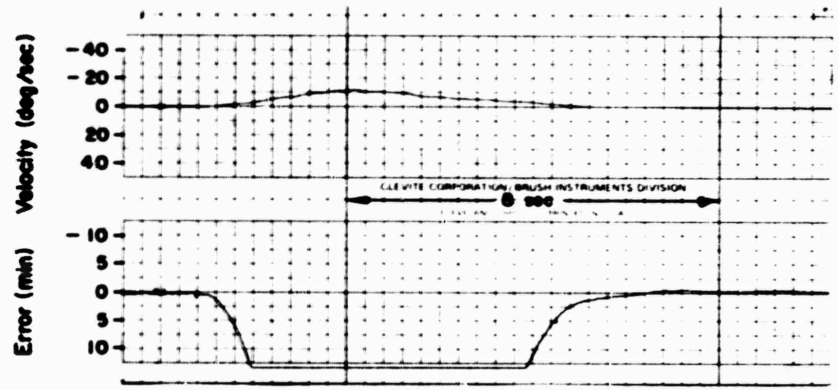


Figure 16. Synchronizing Time Test, stationary input signal 20° high.

Figure 17. Synchronizing Time Test, stationary input signal 20° low.

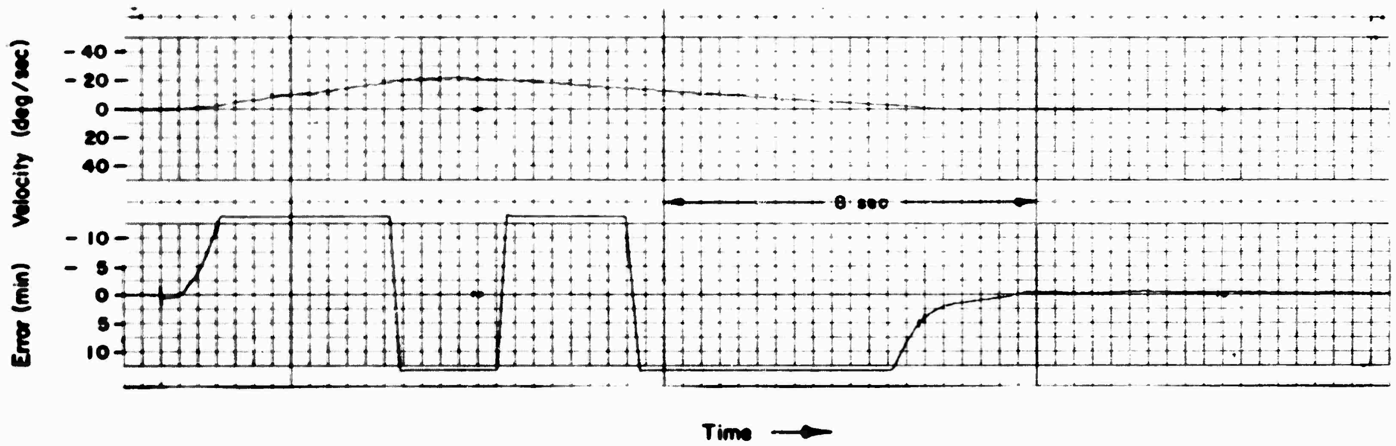


Figure 18. Synchronizing Time Test, stationary input signal 45° high.

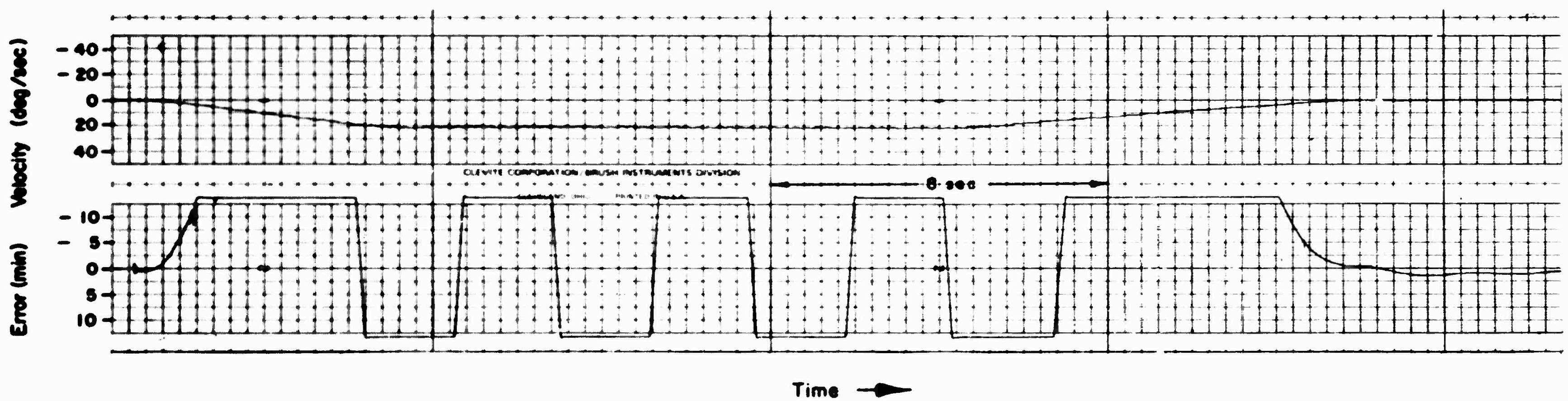


Figure 19. Synchronizing Time Test, stationary input signal 45° low.

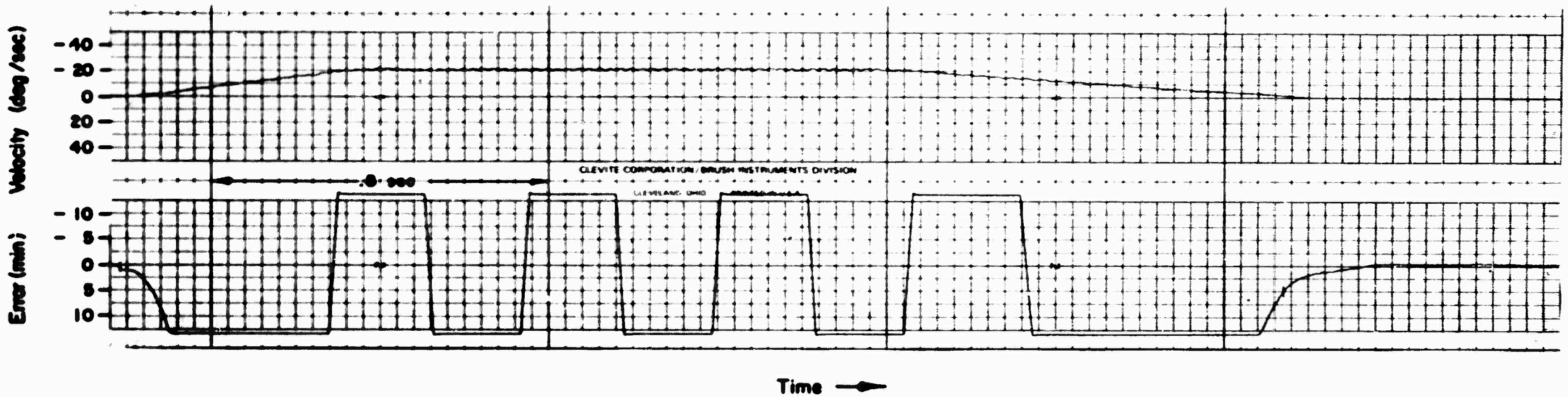


Figure 20. Synchronizing time test, Constant velocity input signal of 5°/sec, initial error of 0°.

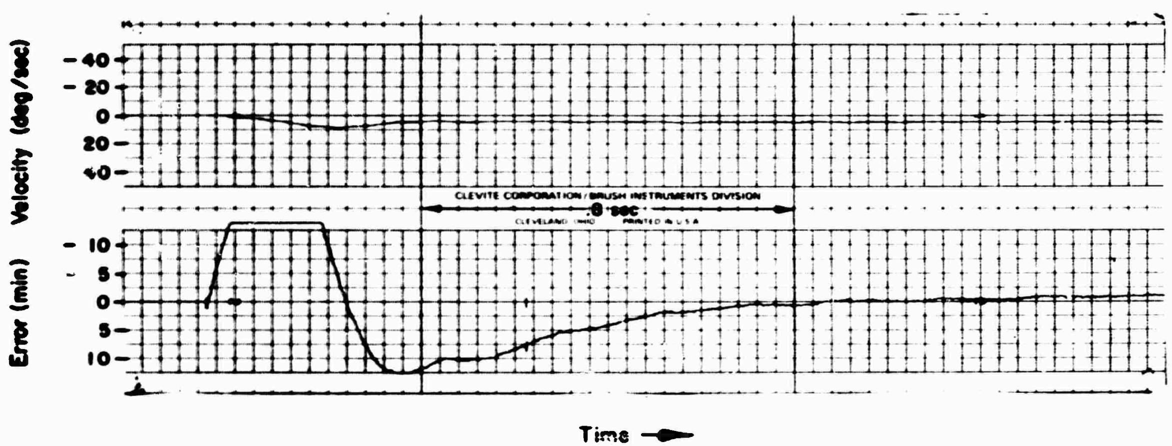


Figure 21. Synchronizing Time Test, constant velocity input signal approaching gun position of 5°/sec, initial error of 30° (gun depresses to synchronize, then elevates at 5°/sec).

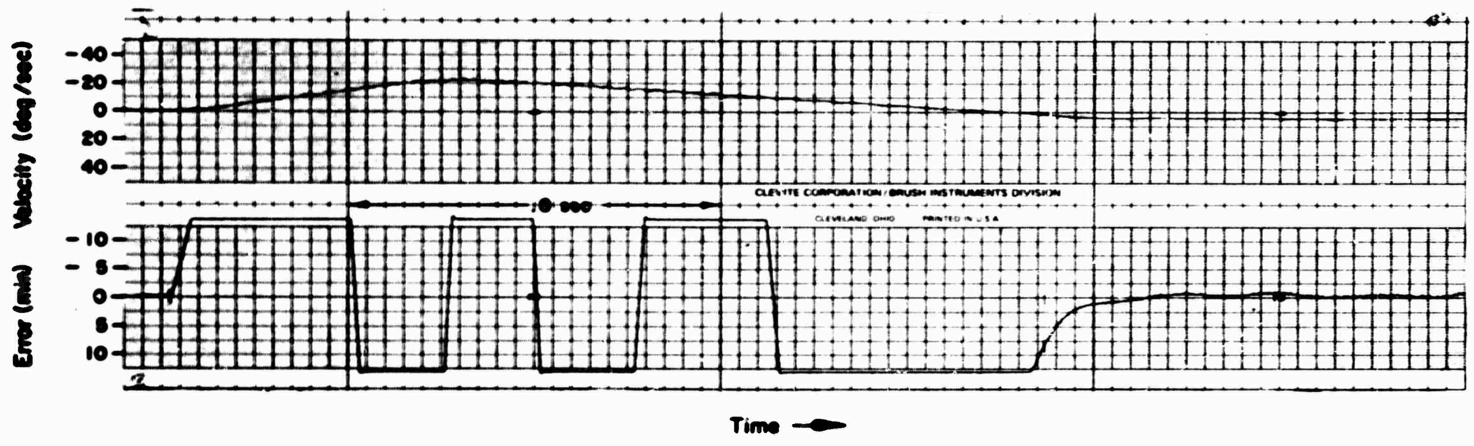


Figure 22. Synchronizing Time Test, constant velocity input signal departing gun position of 5°/sec, initial error of -60° (gun elevates to synchronize, then elevates at 5°/sec).

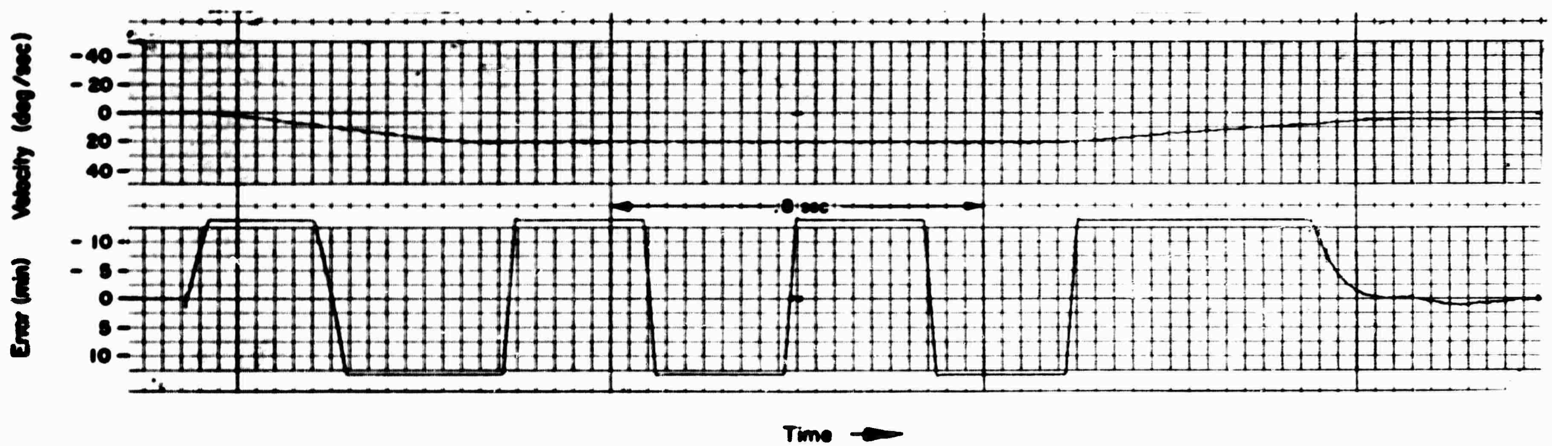


Figure 23. Synchronizing Time Test, Constant velocity input signal approaching gun position of 5°/sec, initial error of 60° (gun depresses to synchronize, then elevates at 5°/sec)

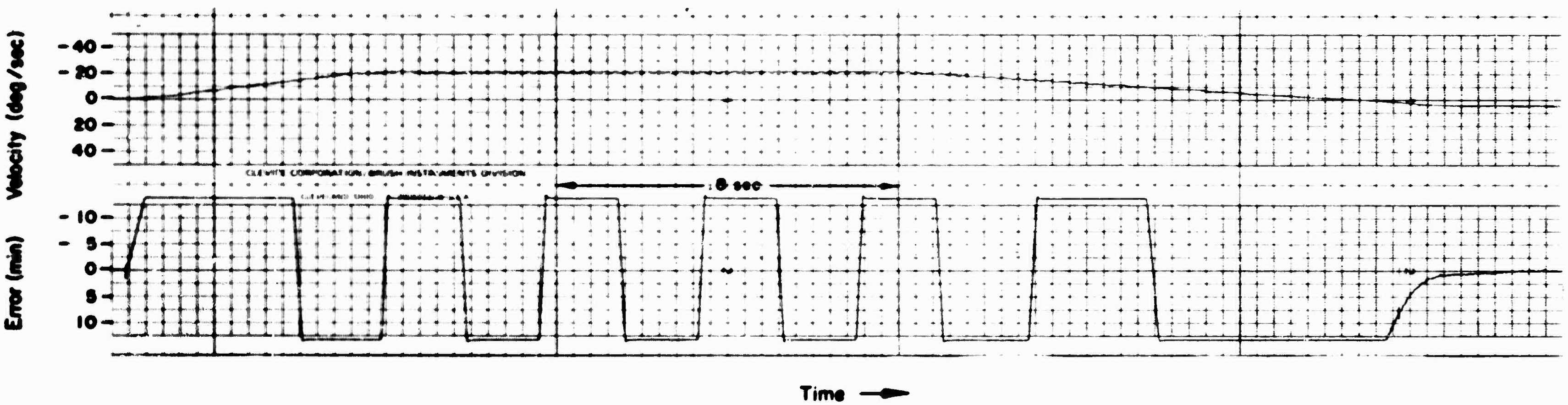


Figure 24. Synchronizing Time Test, Constant velocity input signal approaching gun position of 10°/sec, initial error of 30° (gun depresses to synchronize, then elevates at 10°/sec).

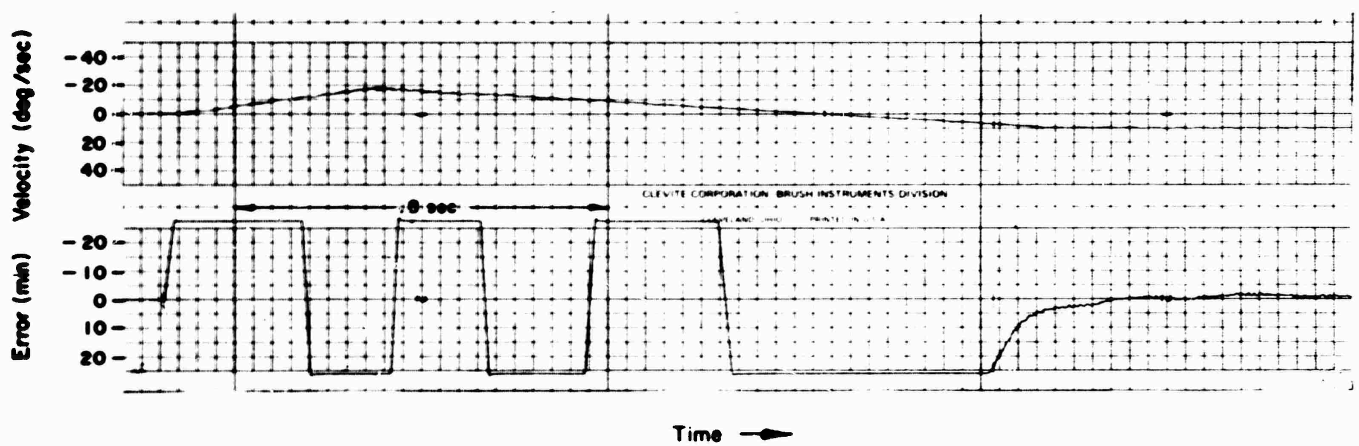


Figure 25. Synchronizing Time Test, Constant velocity input signal of 10°/sec, initial error of 0°.

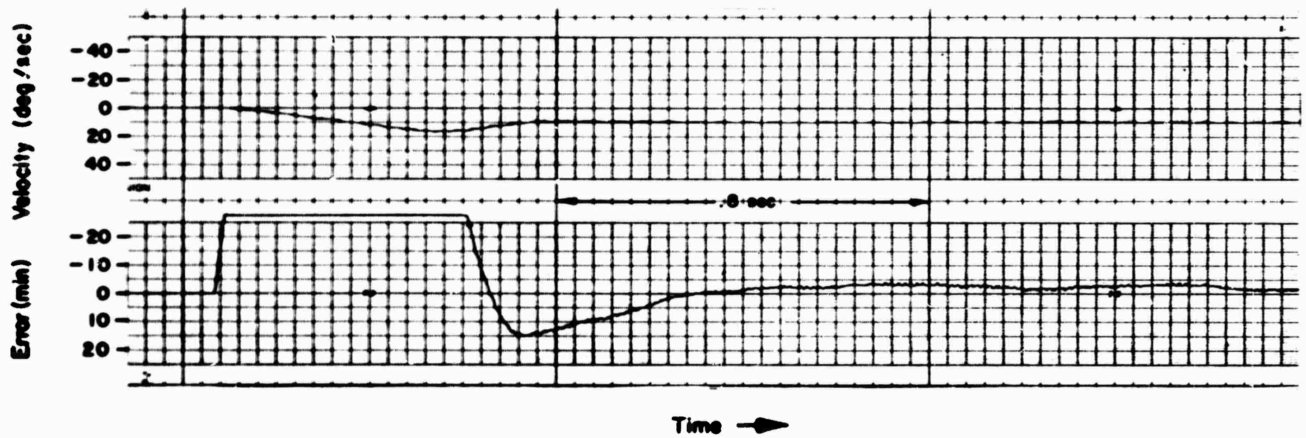


Figure 26. Synchronizing Time Test, constant velocity input signal approaching gun position of 10°/sec, initial error of 60° (gun depresses to synchronize, then elevates at 10°/sec).

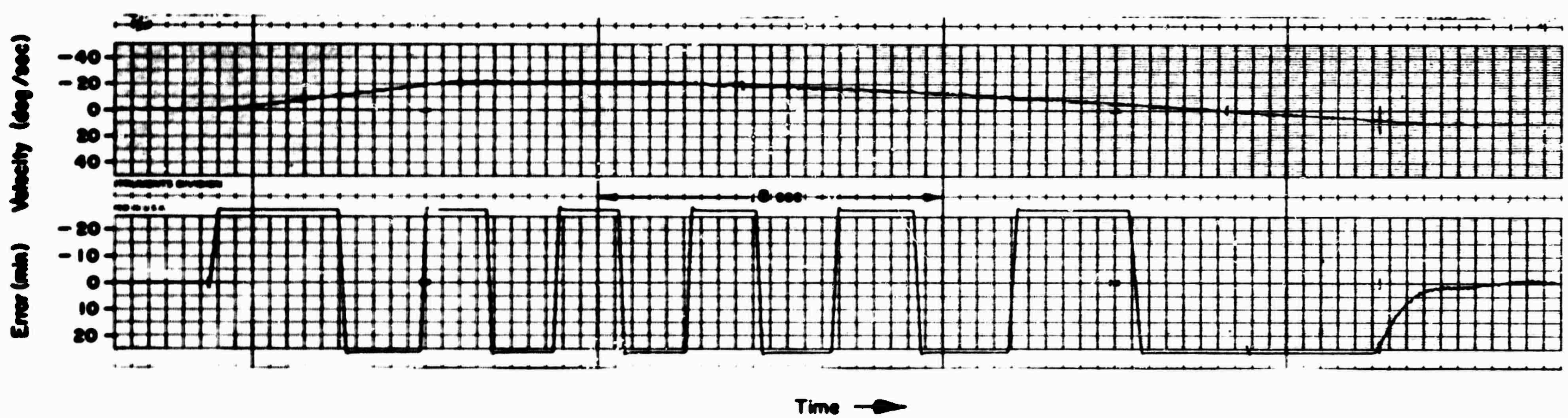


Figure 27. Synchronizing Time Test, constant velocity input signal approaching gun position of 10°/sec, initial error of 90°, (gun depresses to synchronize, then elevates at 10°/sec).

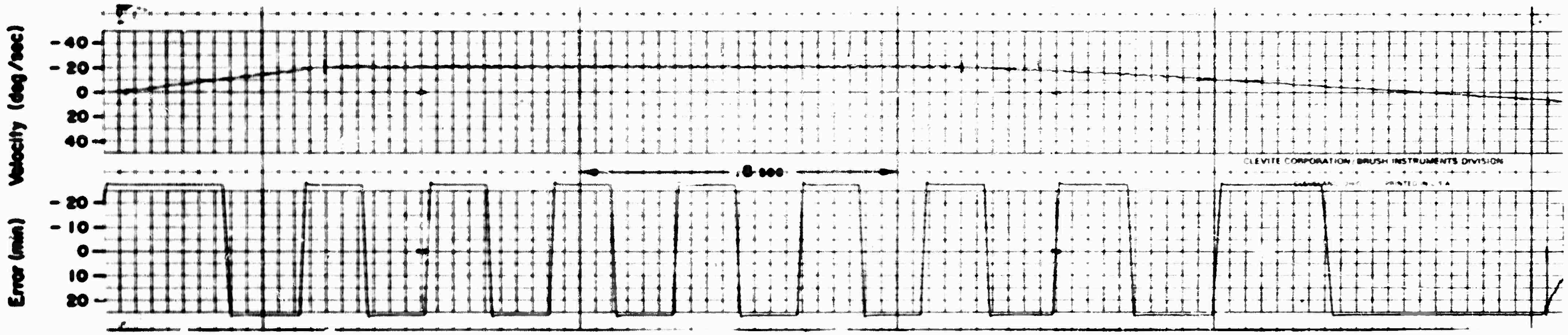


Figure 28. Synchro Power Failure Test, stationary input signals: Fixed point to a higher fixed point. Pip on position trace indicates interruption of synchro power.

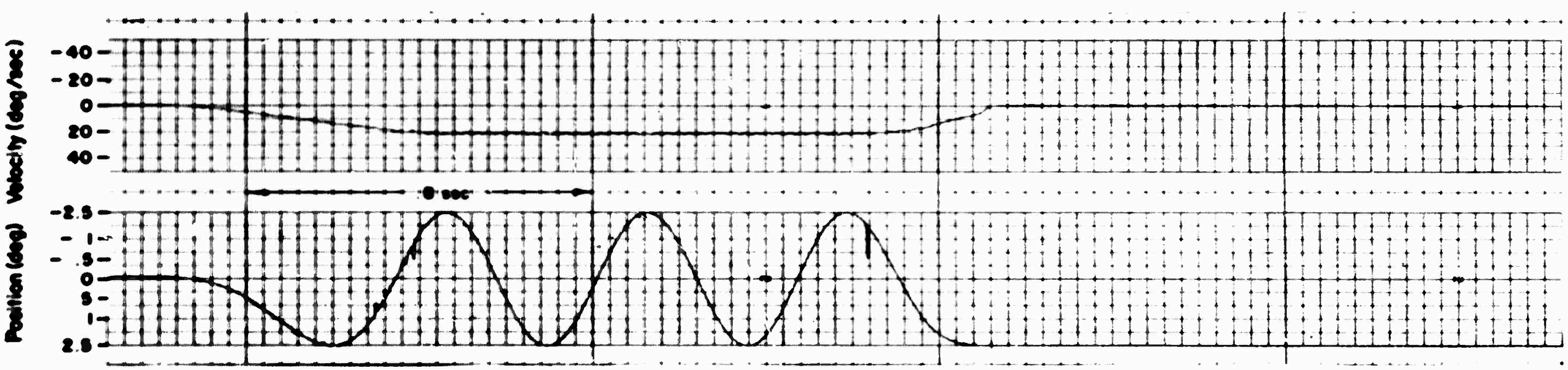


Figure 29. Synchro Power Failure Test, stationary input signals: Fixed point to a lower fixed point. Pip on position trace indicates interruption of synchro power.

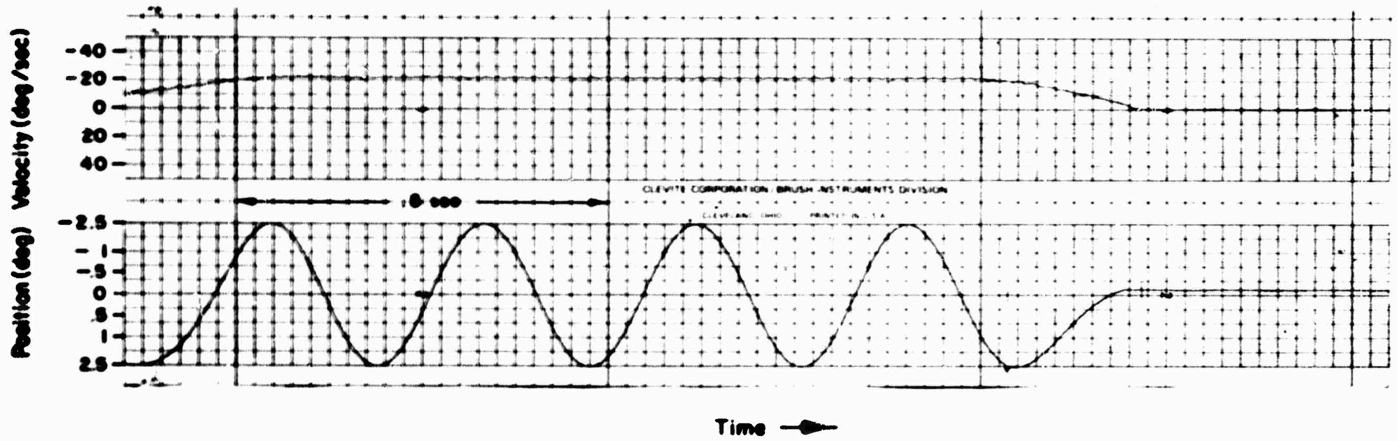


Figure 30. Limit Stop Test, constant velocity input signal of 10°/sec (elevated into upper limit stop).

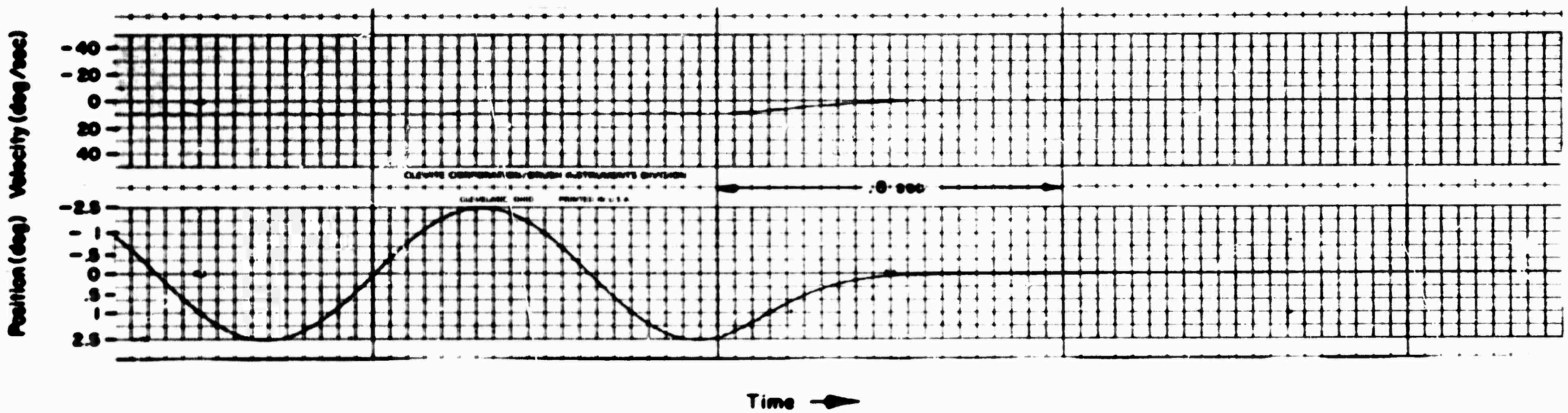


Figure 31. Limit Stop Test, constant velocity input signal of -10°/sec (depressed into lower limit stop).

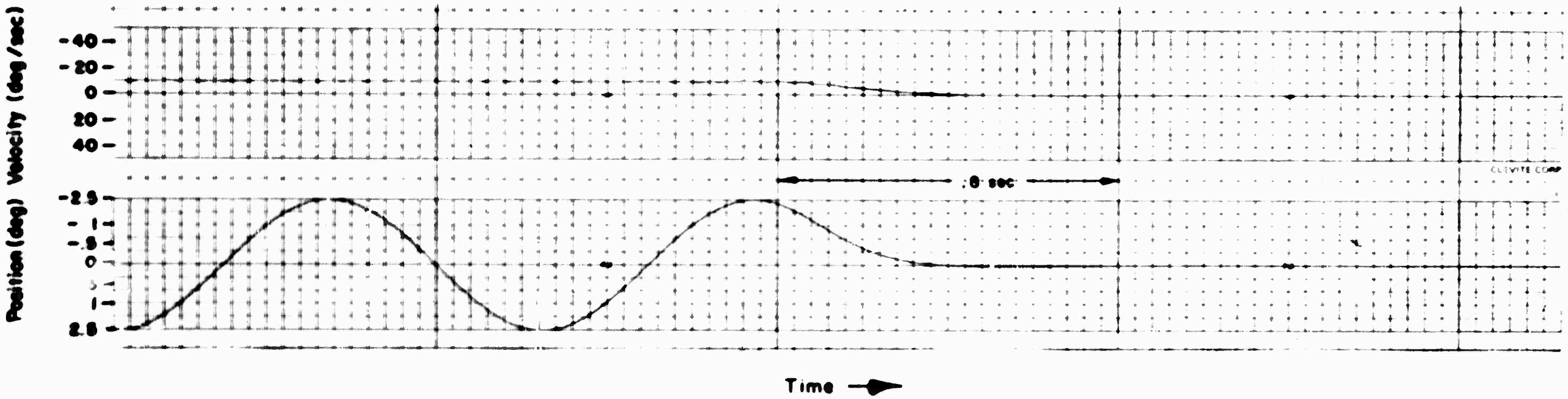


Figure 32. Limit Stop Test, stationary input signals: fixed point to a higher fixed point beyond the upper limit stop (elevated into upper limit stop at maximum velocity).

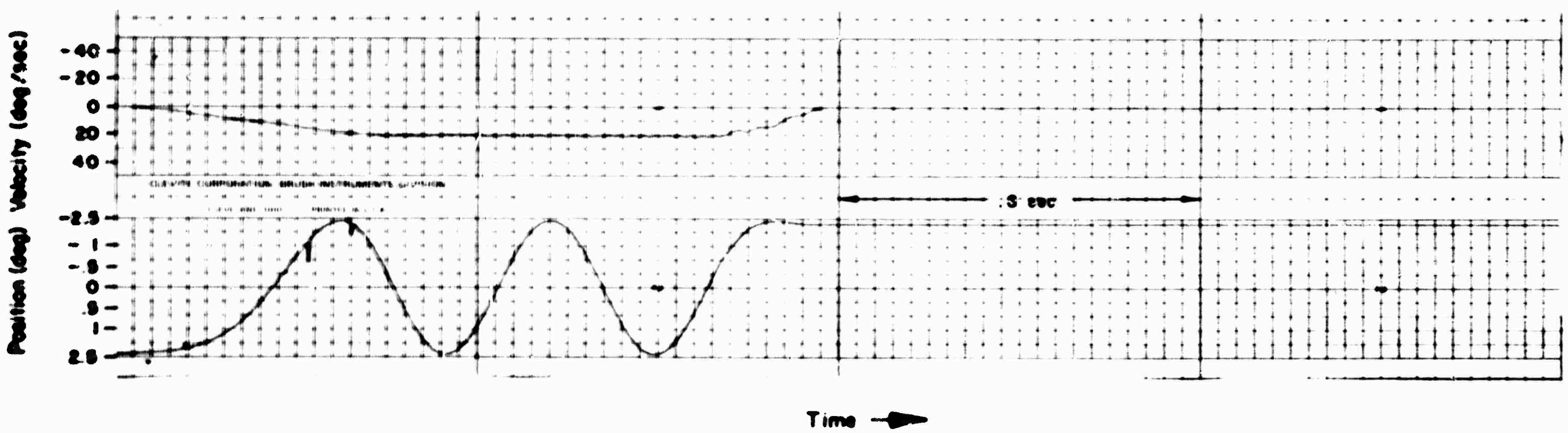


Figure 33. Limit Stop Test, stationary input signals: Fixed point to a lower fixed point beyond the lower limit stop (depressed into lower limit stop at maximum velocity).

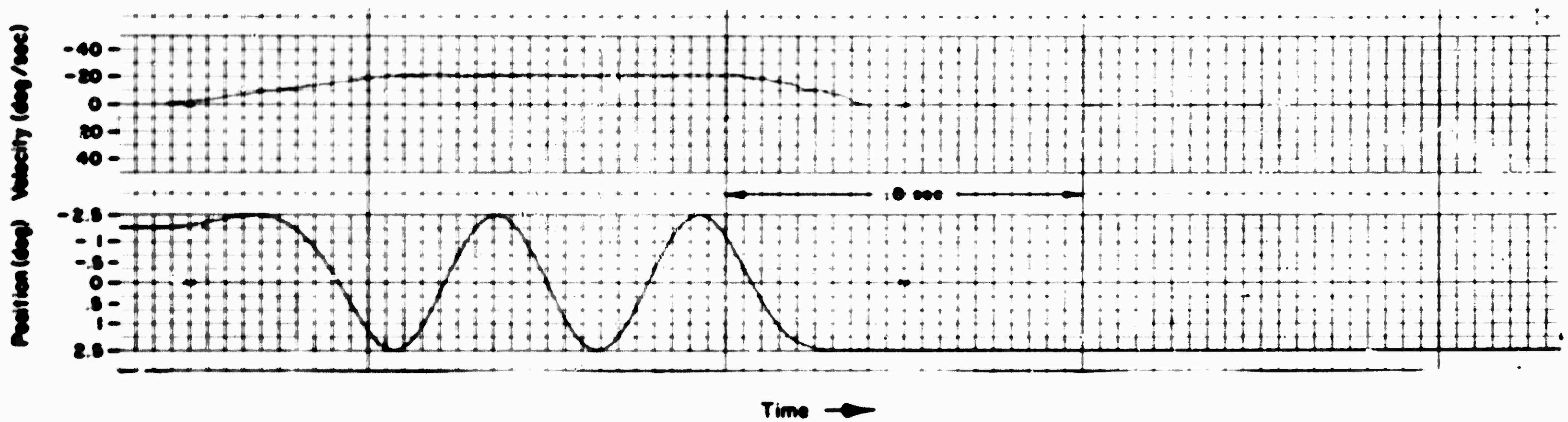


Figure 34. Limit Stop Test, constant velocity input signal of 10°/sec (gun elevated out of lower limit stop).

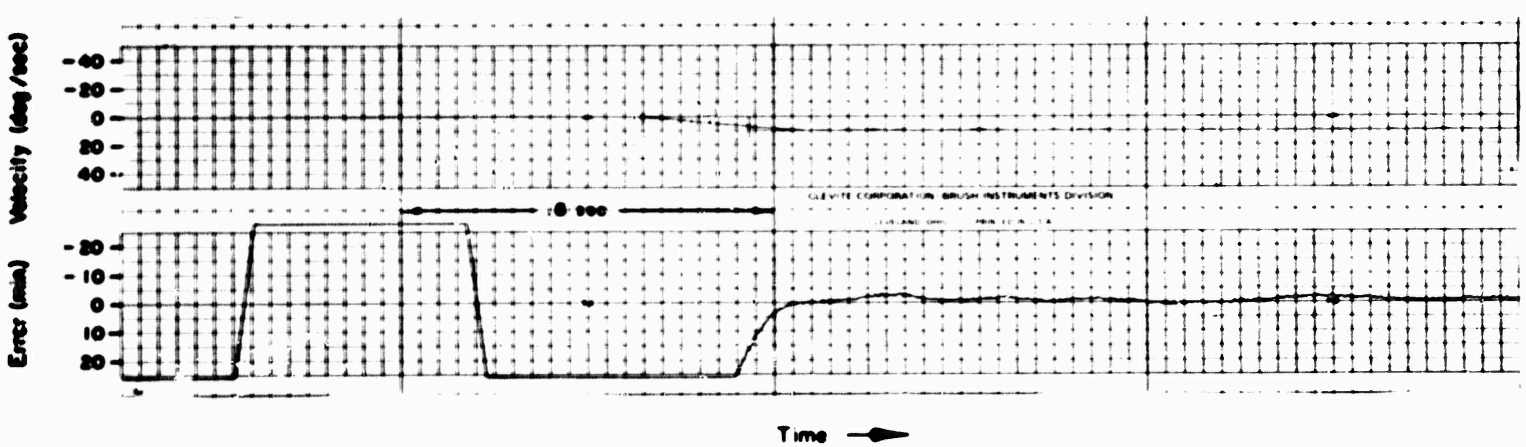


Figure 35. Limit Stop Test, constant velocity input signal of −10°/sec (gun depressed out of upper limit stop).

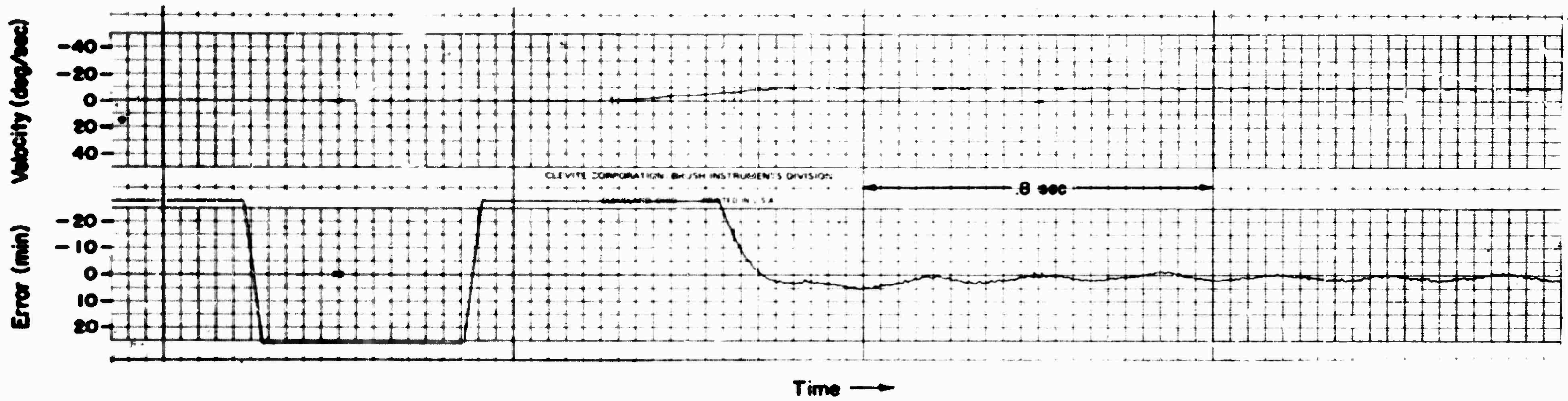


Figure 36. Emergency Limit Stop Test, Constant velocity input signal of 10°/sec (gun elevated into upper emergency limit stop).

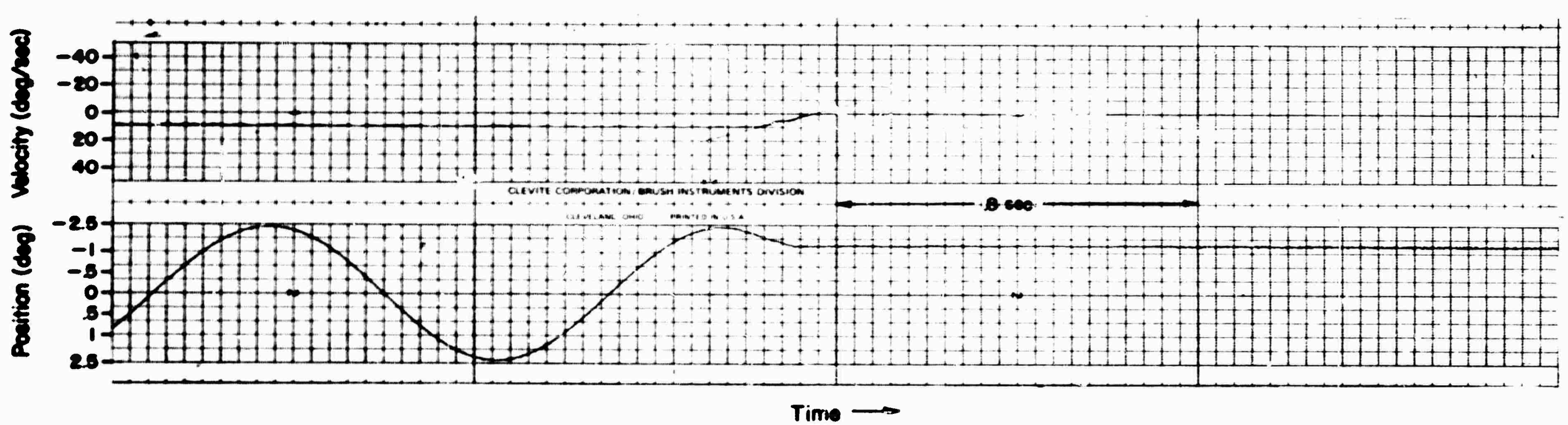


Figure 37. Emergency Limit Stop Test, constant velocity input signal of −10°/sec (gun depressed into upper emergency limit stop).

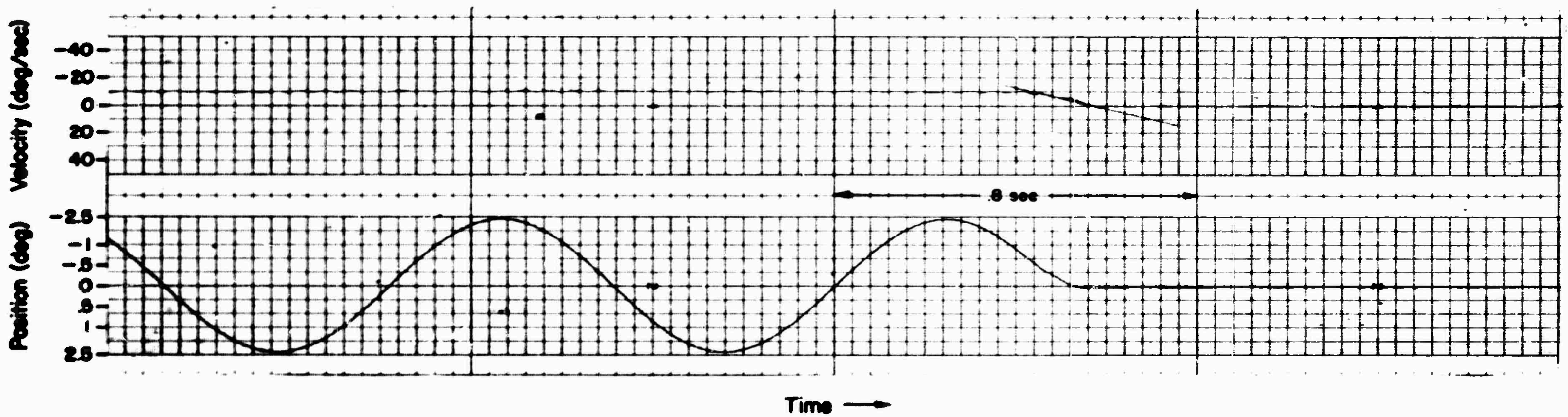


Figure 38. Emergency Limit Stop Test, stationary input signals: Fixed point to a higher point above the upper emergency limit stop (gun elevated into the upper emergency limit stop at maximum velocity).

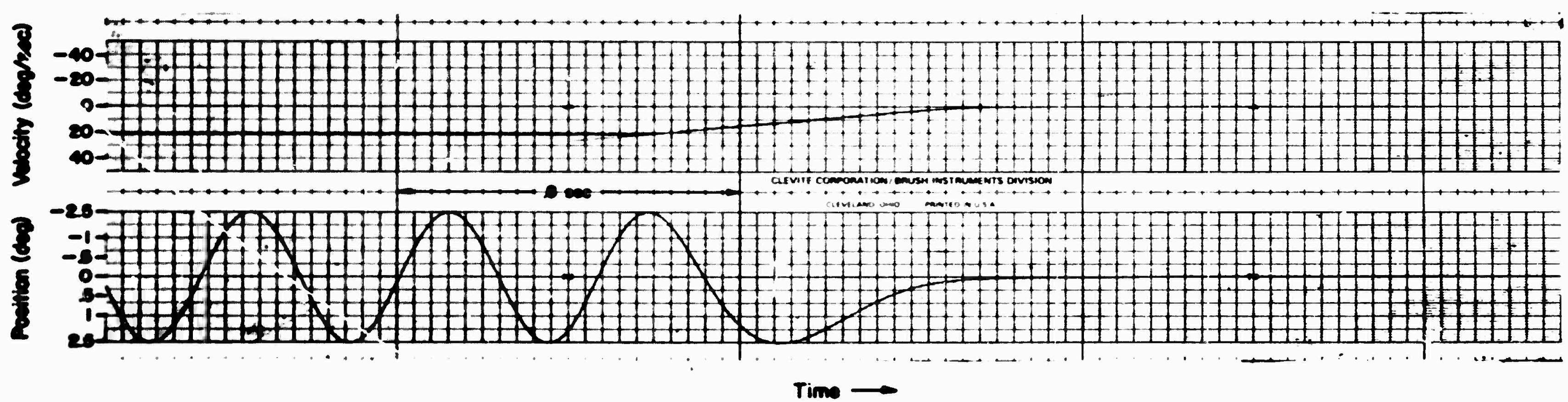


Figure 39. Emergency Limit Stop Test, stationary input signals: Fixed point to a lower point below the lower emergency limit stop (gun depressed into the lower emergency limit stop at maximum velocity).

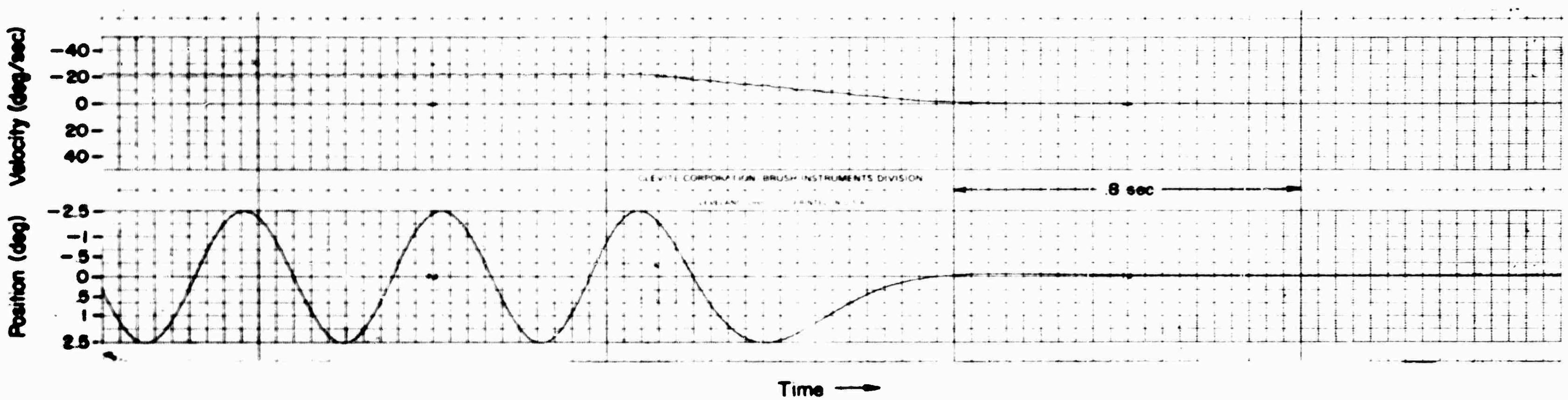


Figure 40. Frequency Response Test, SHM input of 3' amplitude, 0.2Hz frequency.

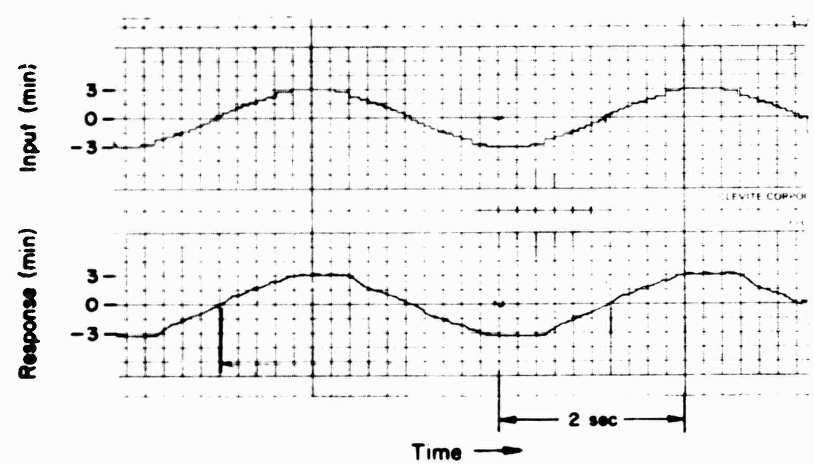


Figure 41. Frequency Response Test, SHM input of 3' amplitude, 0.49Hz frequency.

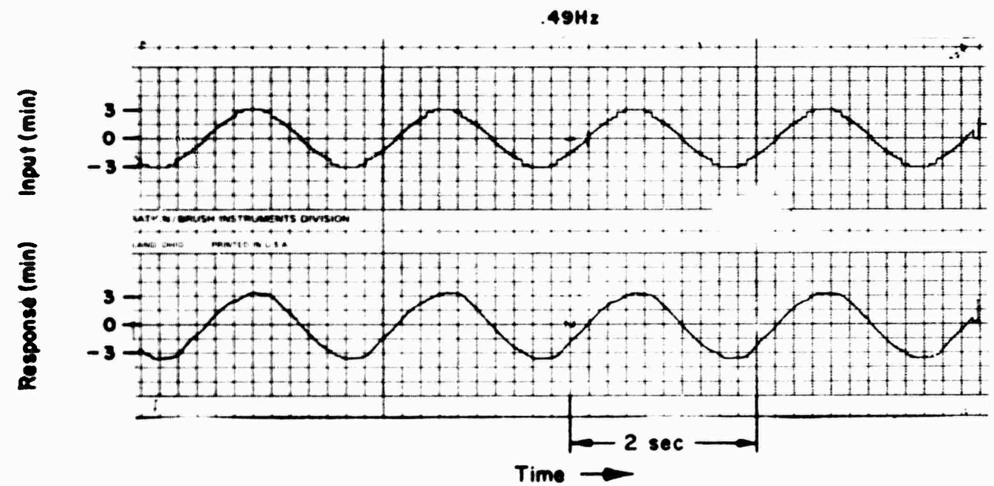


Figure 42. Frequency Response Test, SHM input of 3' amplitude, 0.68Hz frequency.

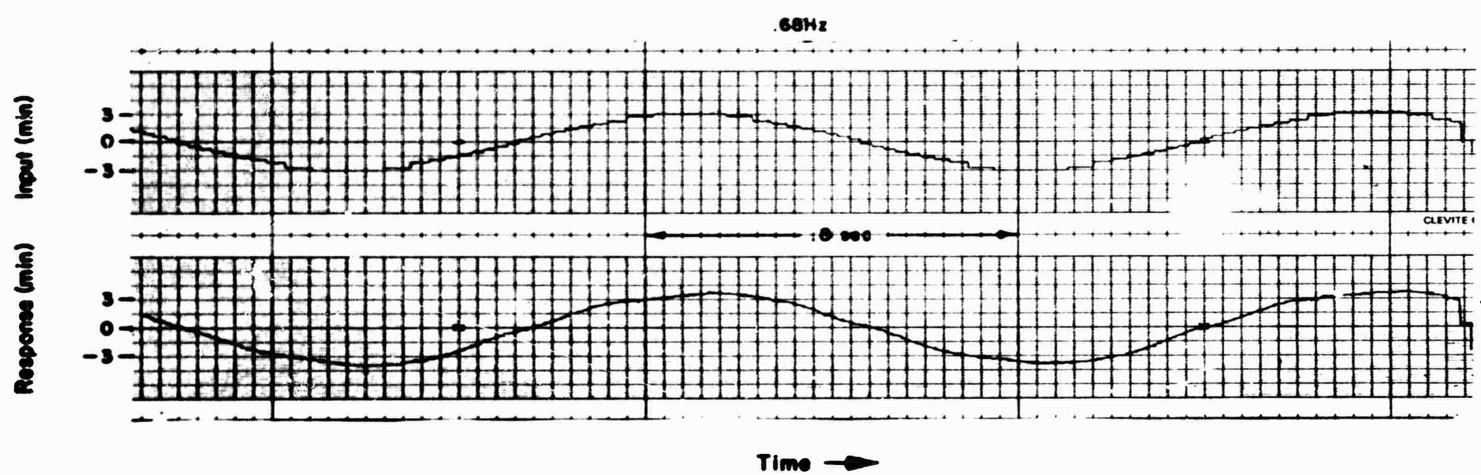


Figure 43. Frequency Response Test, SHM input of 3' amplitude, 1.8Hz frequency.

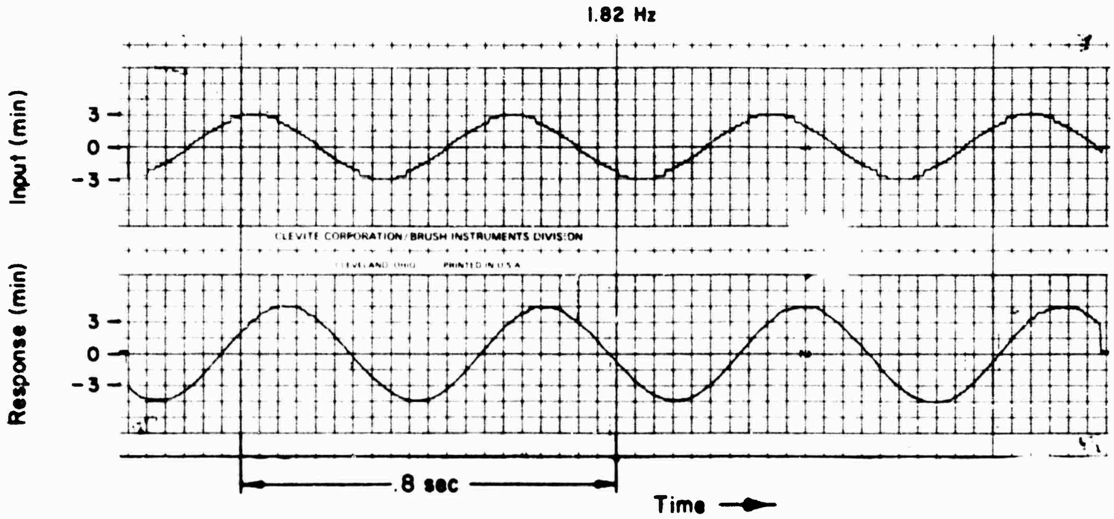


Figure 44. Frequency Response Test, SHM input of 3' amplitude, 2.0Hz frequency.

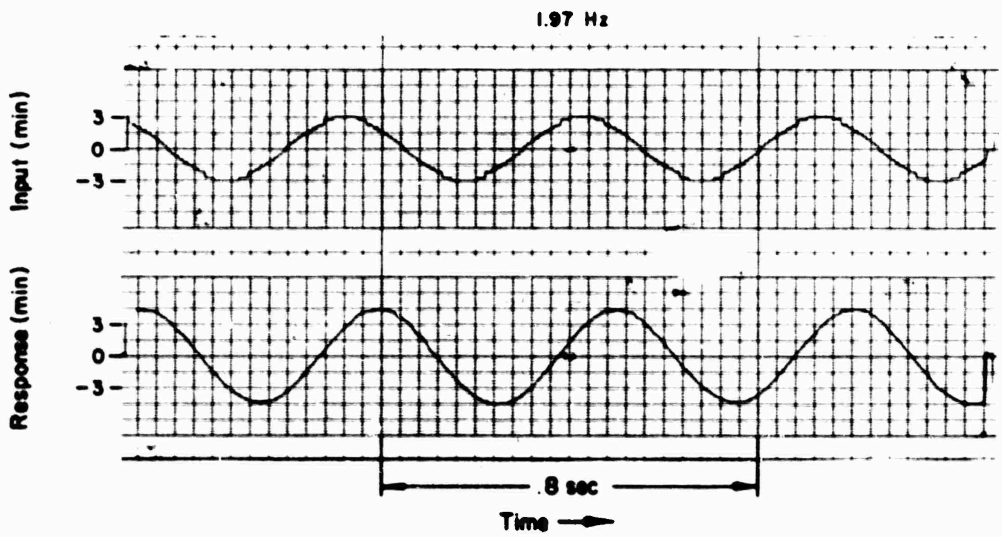


Figure 45. Frequency Response Test, SHM input of 3' amplitude, 2.5Hz frequency.

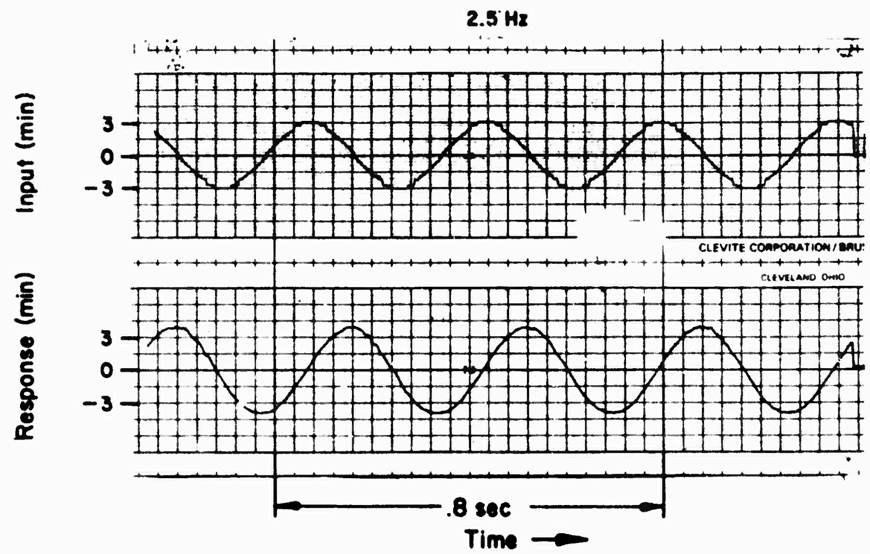


Figure 46. Frequency Response Test, SHM input of 3' amplitude, 2.8Hz frequency.

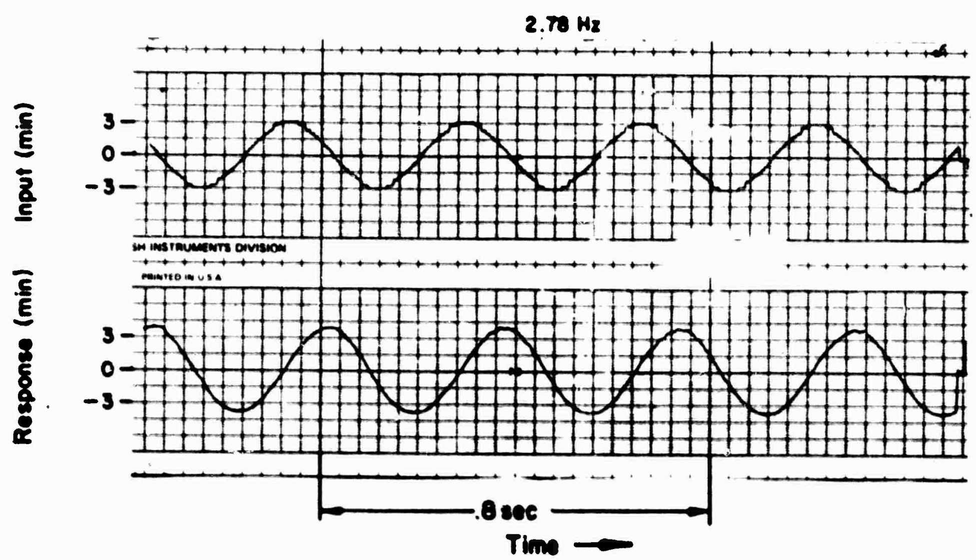


Figure 47. Frequency Response Test, SHM input of 3' amplitude, 4.0Hz frequency.

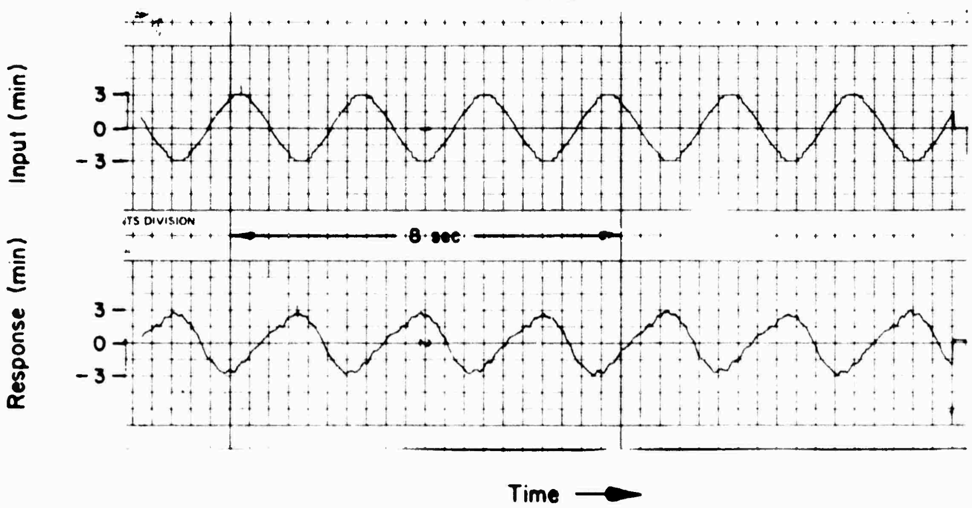


Figure 48. Frequency Response Test, SHM input of 3' amplitude, 5.6Hz frequency.

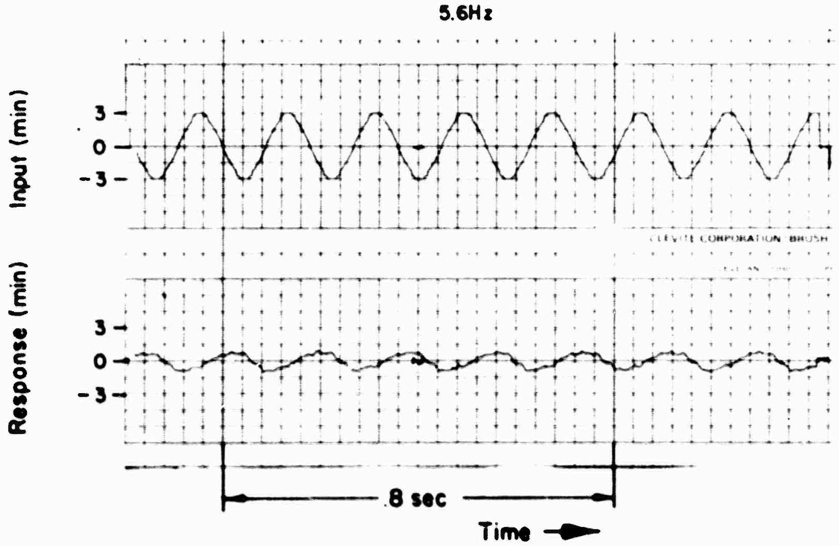
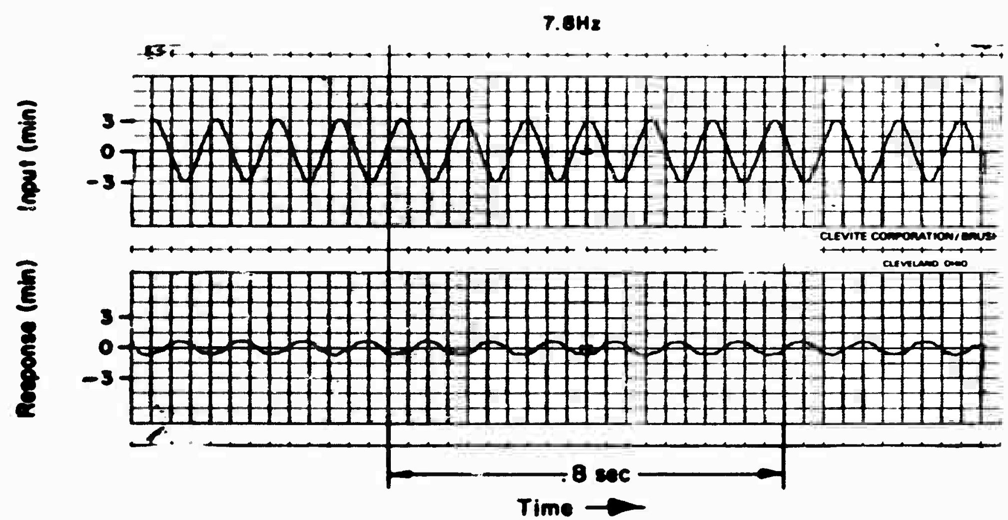


Figure 49. Frequency Response Test, SHM input of 3' amplitude, 7.8Hz frequency.



APPENDIX F

Loading System Test Data
Table F-1
Figures 1 through 24

TABLE F-1

8"/55 MCLGM TECHNICAL EVALUATION LOADING SYSTEM TEST DATA

Figure Number	Component Operation	Cycle Time (sec)	Maximum Velocity
	Drum Indexing		
1	Empty, CW	1.10	32.4°/sec
2	Empty, CCW	1.48	34.8°/sec
3	Loaded (75 rds) CW	1.12	34.1°/sec
4	Loaded (75 rds) CWW	1.56	34.8°/sec
	Clip Transferring		
5	Loaded (3 rds) clip from transfer station to cell one at hoist	0.96	9.8 ft/sec
6	Loaded (2 rds) clip from cell one at hoist to cell two at hoist	0.81	2.6 ft/sec
7	Loaded (1 rd) clip from cell two at hoist to cell three at hoist	0.84	2.6 ft/sec
8	Empty clip from cell three at hoist to transfer station	1.04	11.6 ft/sec
	Hoist Operation (Short Flight)		
9	Empty Hoist Raised	1.17	14.1 ft/sec
10	Empty Hoist Lowered	1.00	16.9 ft/sec
11	Loaded Hoist Raised	1.24	13.8 ft/sec
12	Loaded Hoist Lowered	1.23	14.4 ft/sec
	Cradle Operation with Gun at 0° Elevation		
13	Empty Cradle Raised	1.34	120°/sec
14	Empty Cradle Lowered	0.96	210°/sec
15	Loaded Cradle Raised	1.40	115°/sec
16	Loaded Cradle Lowered	0.93	200°/sec
17	Loaded Cradle Raised with Gun Elevating at 20°/sec (motion relative to slide)	1.01	140°/sec
18	Loaded Cradle Raised with Gun Depressing at 20°/sec	1.32	100°/sec
	Breechblock Operation with Gun at Battery		
	Opened	0.19	–
	Closed	0.29	–
	Empty Case Tray Operation		
19	Empty Case Tray Lowered Empty	0.56	489°/sec
20	Empty Case Tray Raised Loaded	0.95	240°/sec
	Rammer Operation		
21	Extended Empty at 0° Elevation	0.66	21.1 ft/sec
22	Retracted at 0° Elevation	0.60	23.1 ft/sec
23	Extended Loaded at 0°30′ Elevation	0.79	18.5 ft/sec
24	Extended Loaded at 65° Elevation	0.86	15.8 ft/sec

TABLE F-1 (Continued)

Figure Number	Component Operation	Cycle Time (sec)	Maximum Velocity
	Hoist Pawl Positioner Operation		
	Extended	0.17	–
	Retracted	0.17	–
	Round Centering Snubber & Latch Operation		
	Extended	0.29	–
	Retracted	0.29	–

Figure 1. Empty loader drum indexed one cell clockwise.

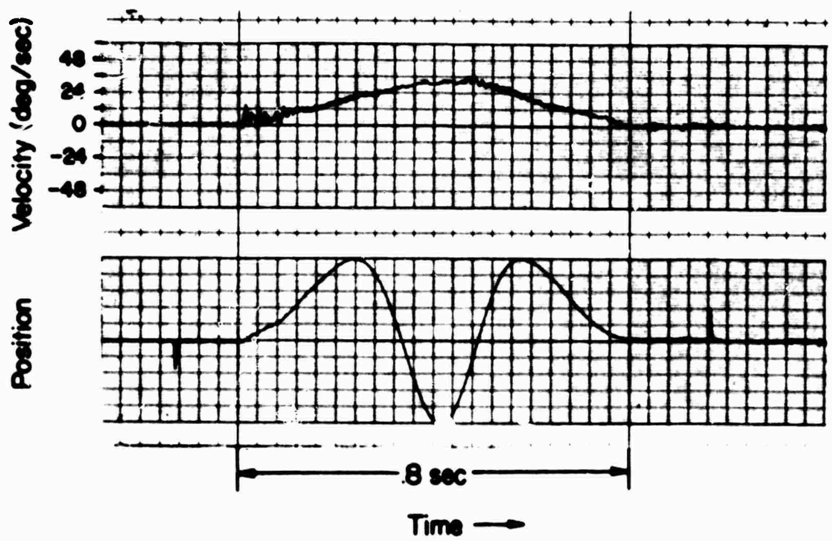


Figure 2. Empty loader drum indexed one cell counterclockwise.

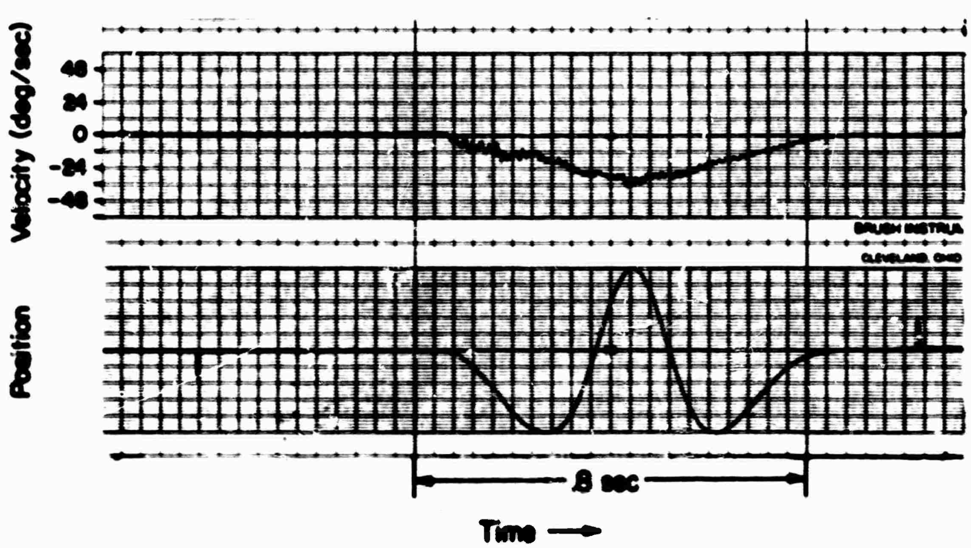


Figure 3. Drum loaded with 75 rounds indexed one cell clockwise.

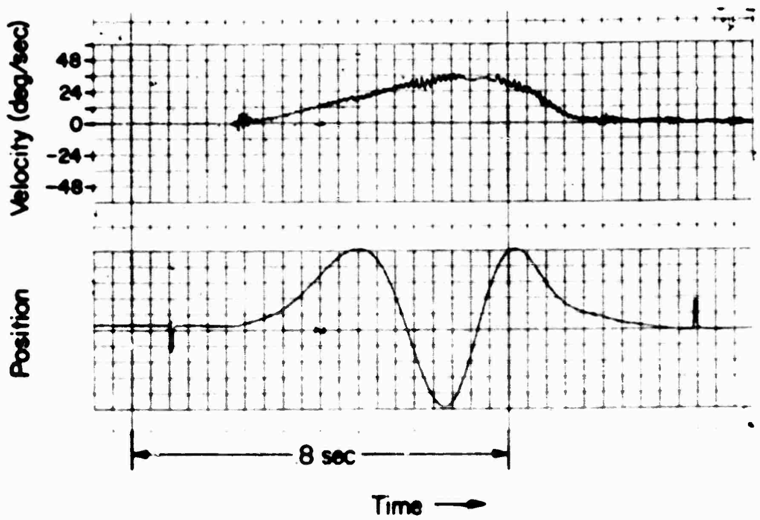


Figure 4. Drum loaded with 75 rounds indexed one cell counterclockwise.

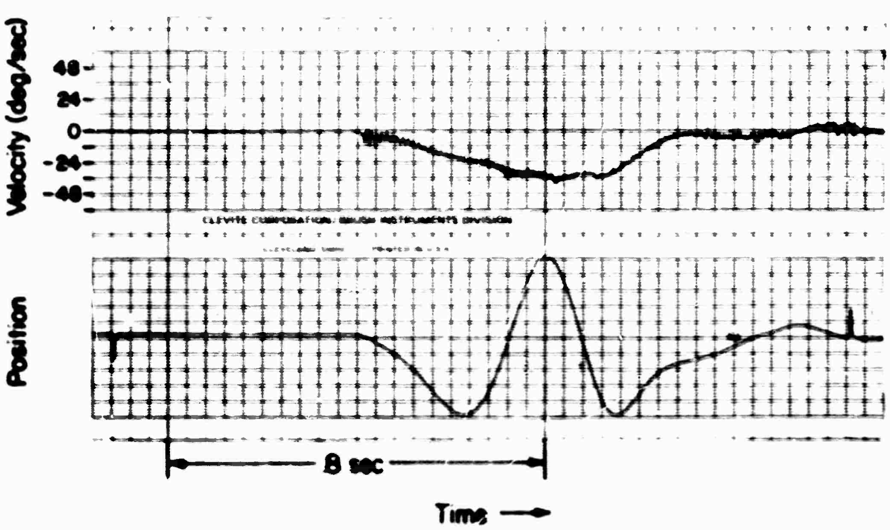


Figure 5. Clip transferred from transfer station to cell one at hoist with three rounds in the clip.

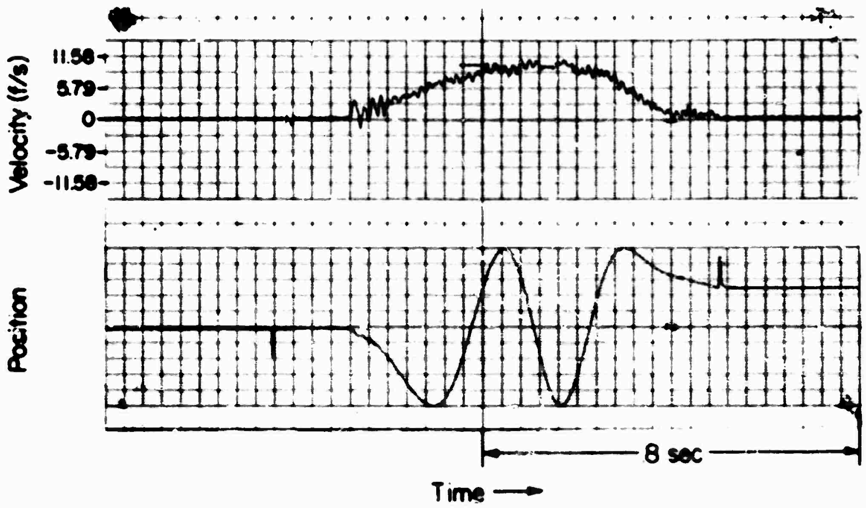


Figure 6. Clip transferred from cell one at hoist to cell two at hoist with two rounds in the clip.

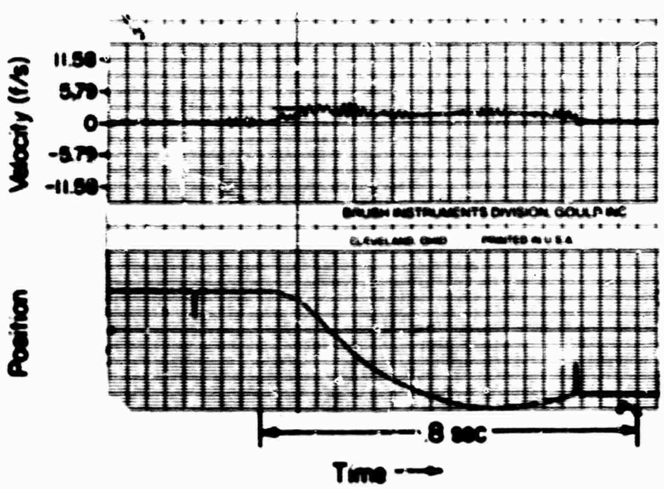


Figure 7. Clip transferred from cell two at hoist to cell three at hoist with one round in the clip.

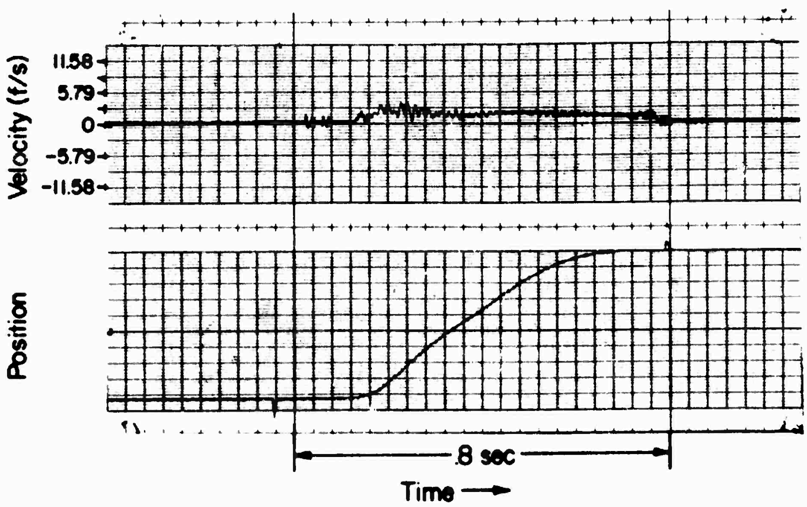


Figure 8. Empty clip transferred from cell three at hoist to clip at transfer station.

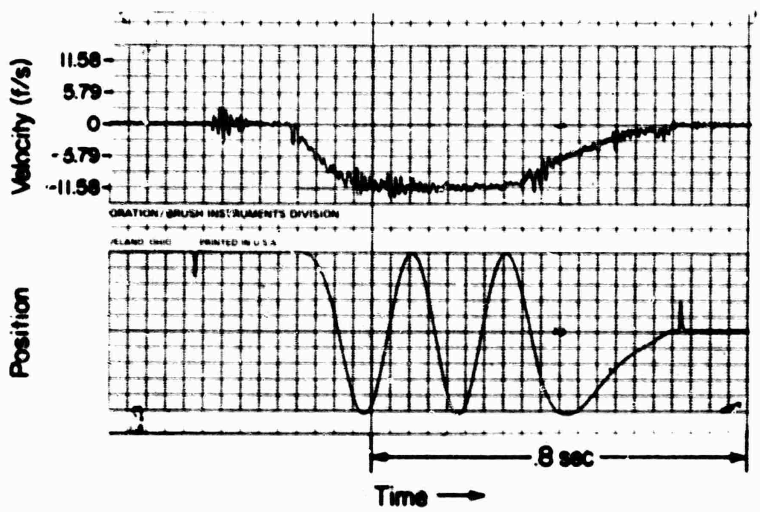


Figure 9. Empty hoist raised (Short Round Flight).

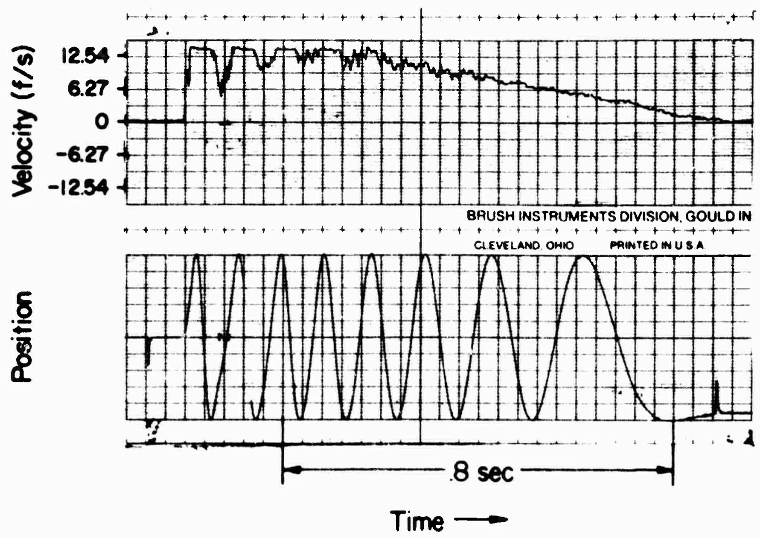


Figure 10. Empty hoist lowered (Short Round Flight).

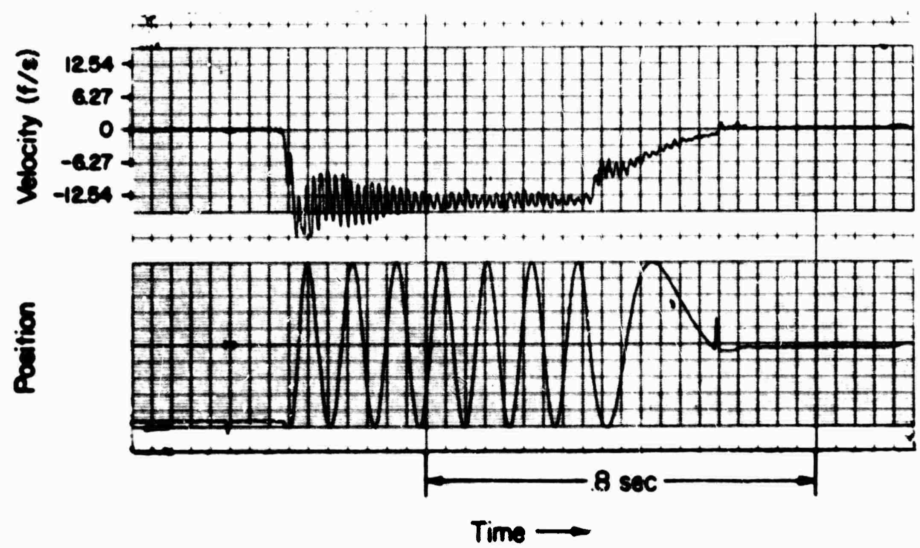


Figure 11. Hoist raised loaded with a short round.

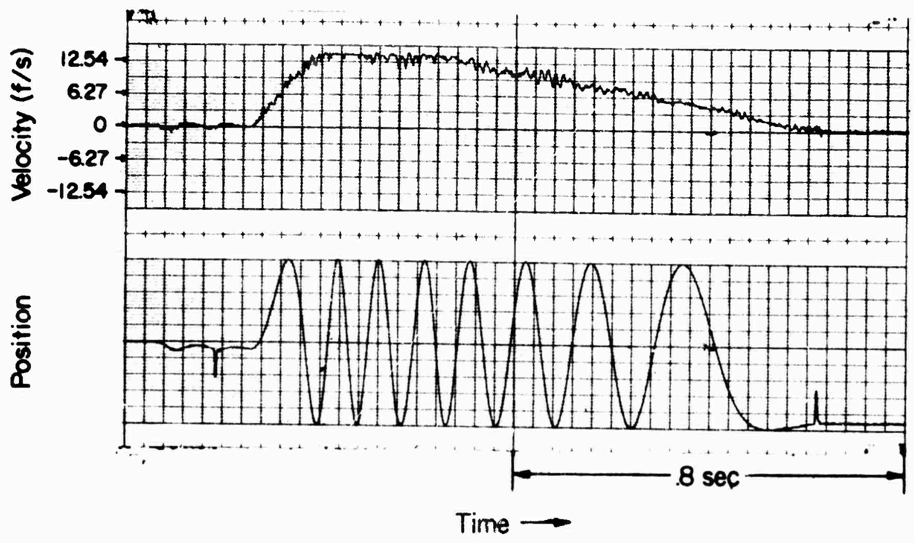


Figure 12. Hoist lowered with a short round.

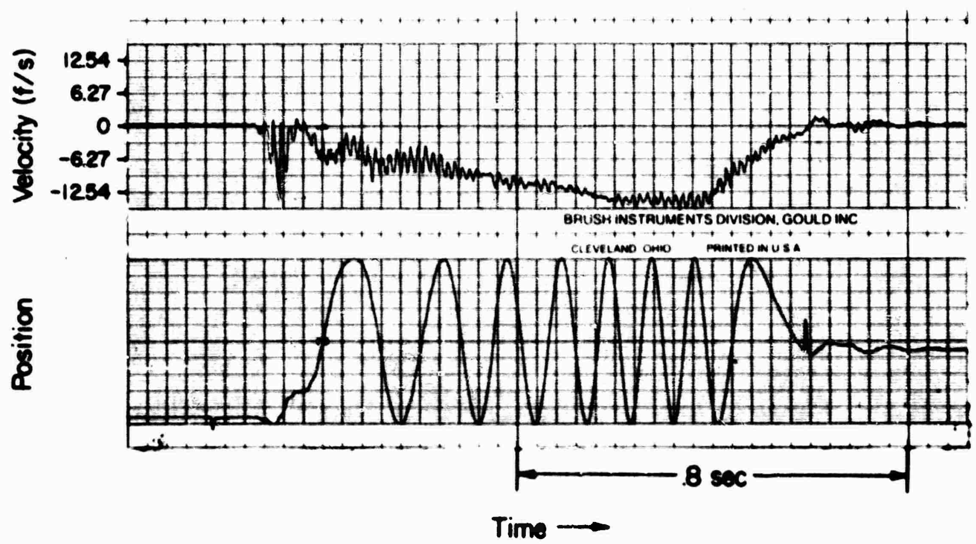


Figure 13. Empty cradle raised with the gun at 0° elevation.

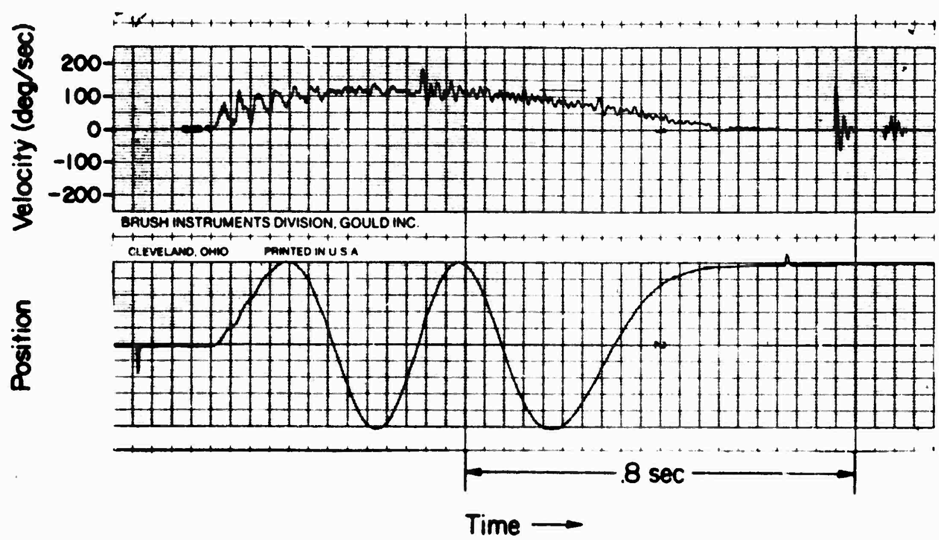


Figure 14. Empty cradle lowered with the gun at 0° elevation.

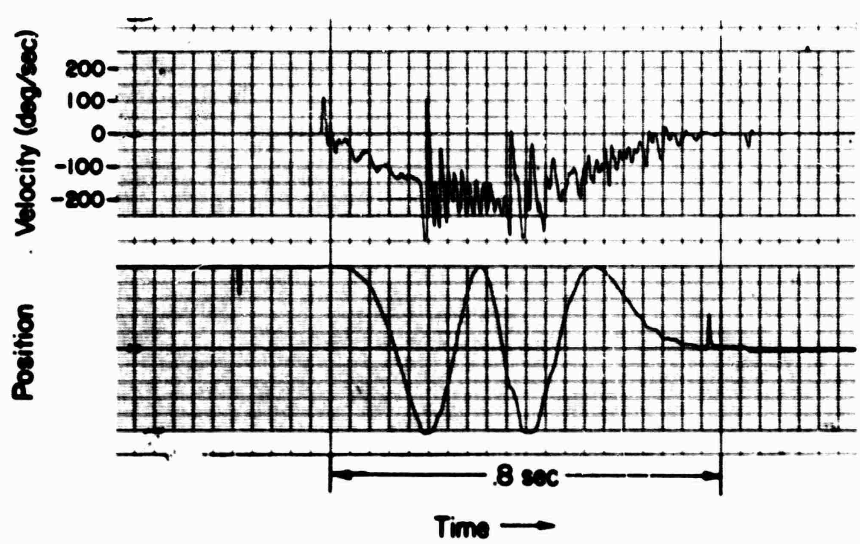


Figure 15. Loaded cradle raised with the gun at 0° elevation.

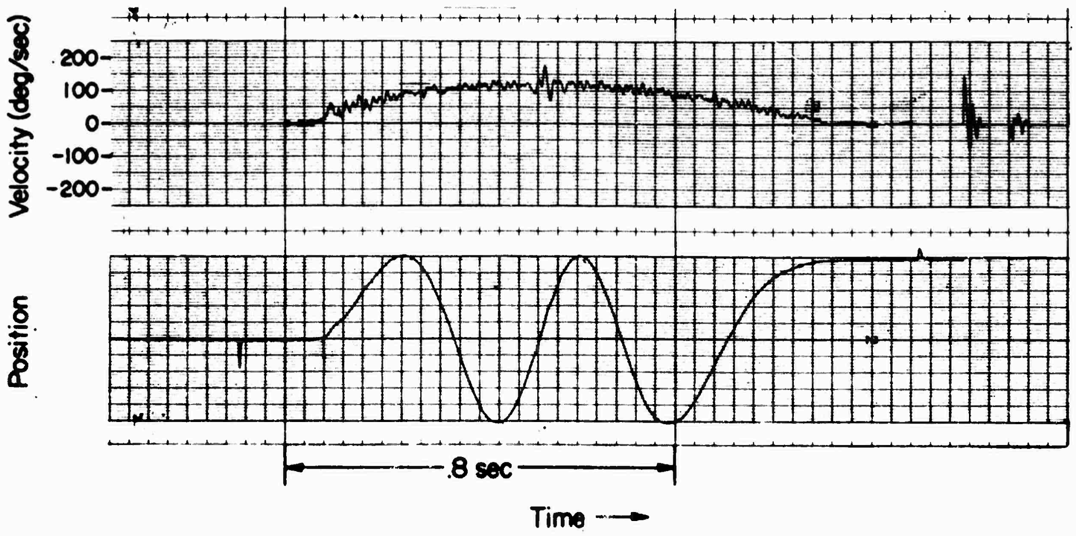


Figure 16. Loaded cradle lowered with the gun at 0° elevation.

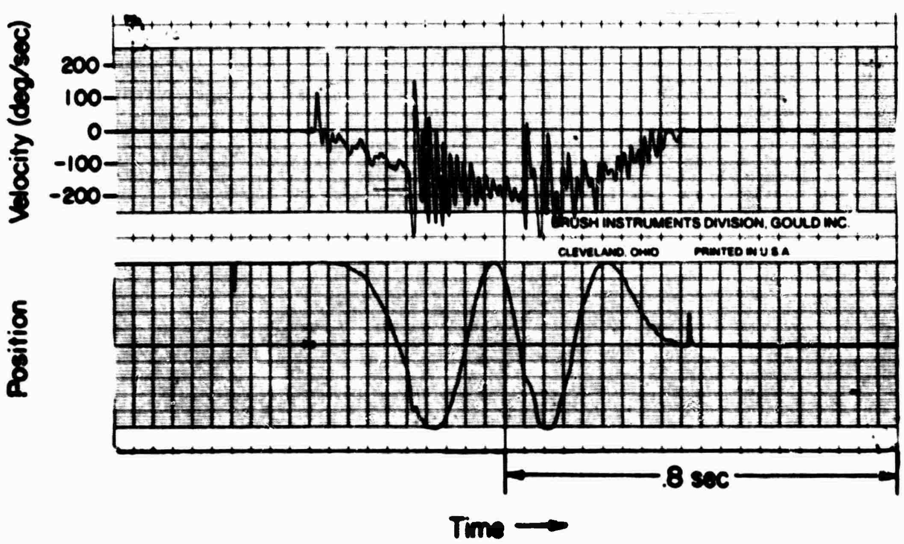


Figure 17. Loaded cradle raised with the gun elevating 20°/sec (cradle velocity and position are relative to the slide).

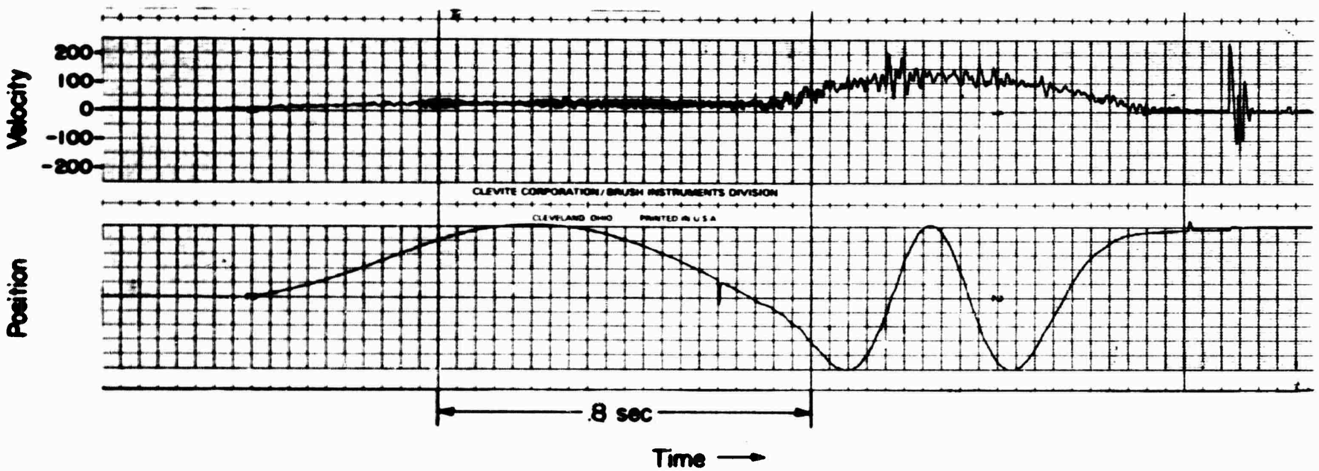


Figure 18. Loaded cradle raised with the gun depressing at 20°/sec (cradle velocity and position are relative to the slide).

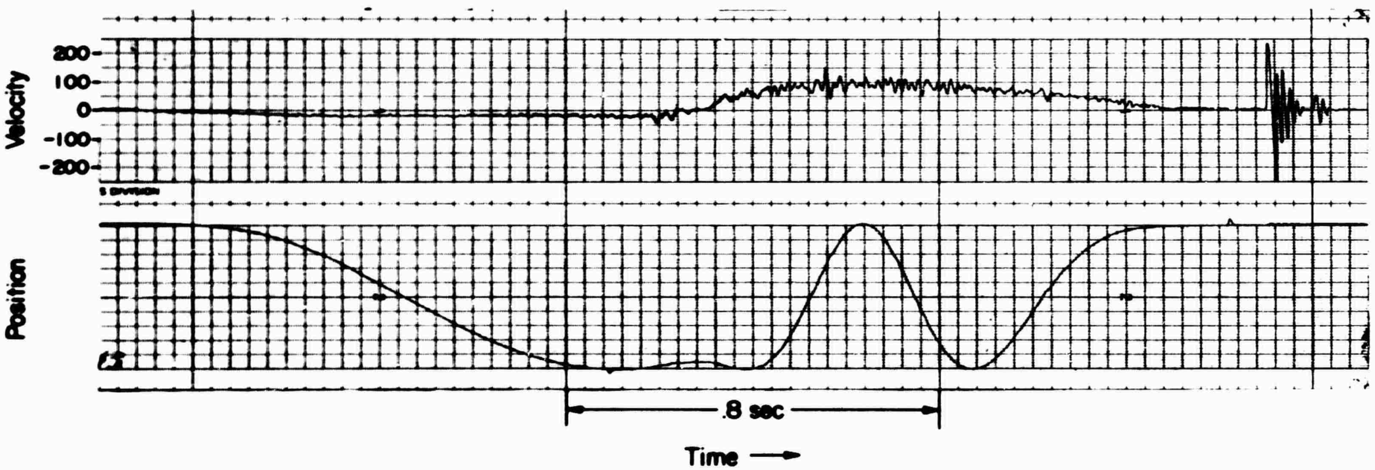


Figure 19. Empty case tray lowered.

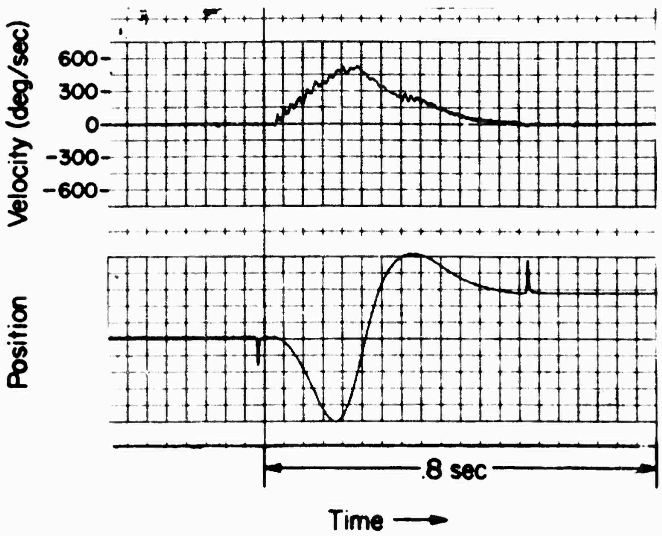


Figure 20. Loaded empty case tray lowered.

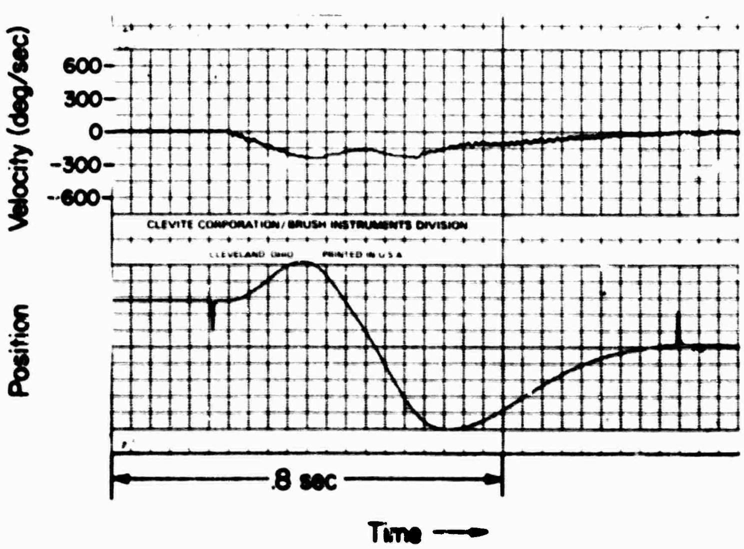


Figure 21. Rammer extended empty with the gun at 0° elevation.

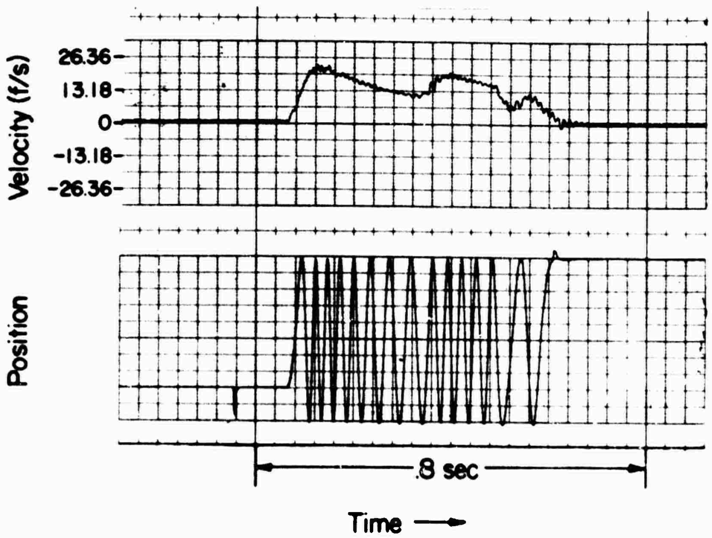


Figure 22. Rammer retracted with the gun at 0° elevation.

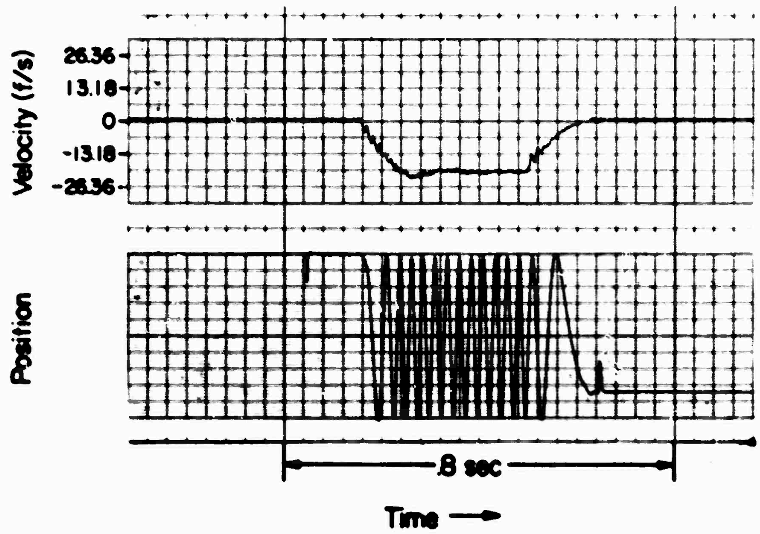


Figure 23. Rammer extended loaded with the gun at 0°30' elevation.

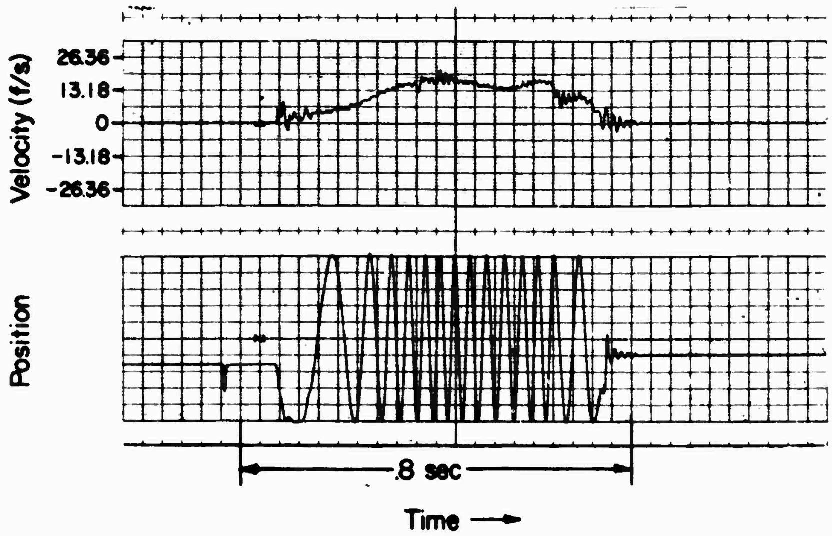
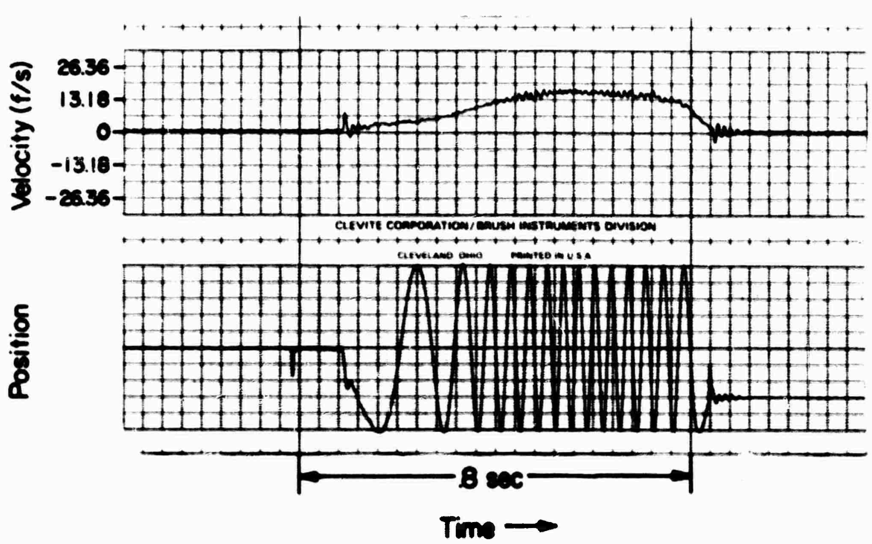


Figure 24. Rammer extended loaded with the gun at 65° elevation.



APPENDIX G

Tabulated Firing Data
Tables G-1 Through G-3

TABLE G-1

8"/55 MAJOR CALIBER LIGHTWEIGHT GUN MOUNT MARK 71 MOD 0

SUMMARY OF TEST DATA

Date Fired 1971	Test	Rounds Fired: Slow Fire	Rounds Fired: Rapid Fire	Gun Elevation (Deg/Min)	Bore Enlargement: Origin (in)	Bore Enlargement: Muzzle (in)	Bore Erosion Gauge Reading (in)	Charge Type	Mean[1] Chamber Pressure ± Std Dev (tsi)(Cu)	Mean[1] Trunnion Velocity ± Std Dev (ft/sec)	Mean Rate of Fire (R/M)	Mean[1] Uncorr Range ± Std Dev (yds)	Mean[1] Corr Range ± Std Dev (yds)	Range Table Range (yds)	Uncorr D/R[1] (%)	Corr D/R[1] (%)
9/03	Proof of Mount	3		00 30	.001	.001	[illegible]	Proof Series	–	–	–	–		–	–	–
		3	-	05 00				Proof Series	–	–	–	–	–	–	–	–
9/08	Velocity Check	6		05 00	.003	.000	N.T	Full	18.1±.4	2739±10	–	N.T	–	–	–	–
9/13	Rapid Fire Check	3		05 00	.005	.001	N.T	Near Reduced			–					
			9	05 00					N.T	2551±15	11.91	N.T	–		–	–
9/14	Demonstration		5	10 00	.009	.002	N.T	Near Reduced	N.T	N.T	N.T	N.T			–	
9/15	Case Test	3		10 00	.008	.001	N.T	Proof Series				N.T				
9/16	Rapid Fire Check	1		10 00	N.T	N.T	N.T	Full								
			9	10 00					N.T	[illegible]0±16	12.08	N.T.		–	–	
9/17	Case Test	1		10 00	.006	.002	N.T	Full								
			5	10 00					N.T	2720±19	N.T	N.T				–
		4		10 00				Proof Series						–		–
9/27	Selectability		11	00 30	.012	.002	N.T	Full			3.96(4)					
		-	14	00 30					N.T	2708±9	4.24(4)	N.T	–		–	–
9/28	Rate of Fire		12	10 00	.014	.003	N.T	Full			9.15(5)					
		1		20 00							–					
			2	20 00							–					
		–	2	20 00							–					
		–	3	20 00					N.T	N.T	–	N.T	–	–	–	
10/04	Blast Field	5		00 30	.022	.003	N.T	Full	N.T	2784±10	-	N.T	–	–	–	–
10/06	Clearing Charge	1		00 30	N.T	N.T	N.T	Near Reduced	N.T	2316		N.T	–	–		
	Blast Field	2		00 30				Full	N.T	–		N.T				
		1		00 30					N.T	2740		N.T.				–
	Case Test			[illegible]				Proof	23.9	2827		N.T				
[illegible]	Blast Field	5		00 30	N.T	N.T	N.T	Full	N.T	2721±15		N.T				

TABLE G-1 (Continued)

Date Fired 1971	Test	Rounds Fired Slow Fire	Rounds Fired Rapid Fire	Gun Elevation (Deg/Mils)		Bore Enlargement Origin (in)	Bore Enlargement Muzzle (in)	Bore Erosion Gauge Reading (in)	Charge Type	Mean[1] Chamber Pressure ± Std Dev (psi)(K u)	Mean[1] Trunnion Velocity ± Std Dev (ft/sec)	Mean Rate of Fire (R/M)	Mean[1] Uncorr Range Std Dev (yds)	Mean[1] Corr Range ± Std Dev (yds)	Range Table Range (yds)	Uncorr D/R[1] (%)	Corr D/R[1] (%)
10/08	[illegible] Test	2		[illegible]	[illegible]	N.T	N.T	N.T	Proof Series				N.T				
10/12						.024	.004	N.T									
10/13	Proof of Liner	5		10	00	.002	.003	N.T	Proof Series		-	-	N.T	-	-		-
10/14	Clearing Charge	1	-	10	00	.001	.002	N.T.	Near Full	15.8	-	-	N.T	-	-	-	-
10/22	Demonstration	6	-	10	00	N.T.	N.T	N.T	Near Reduced	N.T	2225±11	-	N.T.	-	-	-	-
11/02	Gun Jump	3	-	03	00	.005	.001	-4.67	Full	N.T	2740	-	6720	6383	6512	-	-
	Rate of Fire	-	12	10	00				Full	N.T	2701±11	12.01	15635±109	15415±166	15336	.53	.83
11/04	Charge Determination	6		00	30	.003	.002	4.63	Red Probing	N.T.	-	-	N.T.	-	-	-	-
			10	20	00				Full	N.T	2711±13	12.03	22585±188	22814±143	22200	.69	.51
		2		20	00				Full	N.T	-	-	N.T.	-			-
11/08	Cam Check		12	00	30	N.T	N.T	N.T	Full	N.T		11.72	N.T				
11/09	Fire-out		19	10	00	.008	.002	4.60	Full	N.T	2705±7	11.86	15115±90	15433±83	15336	.45	.41
		1		10	00				Full	N.T	-		-		-	-	-
11/12	Fire-out		36[2]	10	00	.011	.004	4.45	Full								
		-	21	10	00												
			36	10	00												
			2	10	00					N.T	2700±14	11.90	15273±138	15344±83	15336	.80	.44
11/16	Rate of Fire[4]	-	12	27	00	.048	.013	-3.37	Full	N.T.	2694±16	12.42	26288±258	26043±116	25500	.86	.35
11/22	Rate of Fire		15	08	00	N.T	N.T	N.T	Full	N.T	2675±10	11.88	13174±82	13553±59	13400	.45	.32
	Rate of Fire		18	08	00				Full	N.T	2674±14	N.T.	13103±152	13492±107	13400	.87	.55
11/23	Rate of Fire	-	15	27	00	N.T.	N.T	N.T	Full	N.T.	2695±16	12.26	25475±197	26080±106	25500	.63	.30
	Selectability	-	5	OSC					Full	N.T.	-	-	-	-	-	-	-
11/30	Rate of Fire	-	15	08	00	.054	.017	2.70	Full	N.T	2692±19	11.47[7]	13297±178	13389±79	13400	1.02	.48
	Selectability	-	15	OSC.					Full	N.T	-	4.71[4]	-	-	-	-	-
12/01	Rate of Fire		15	27	00	N.T	N.T	N.T	Full	N.T	2689±8	12.24	25705±205	26062±135	25500	.61	.34
	Rate of Fire	2		27	00				Full	N.T				-	-		-

TABLE G-1 (Continued)

Date Fired 1971	Test	Rounds Fired Slow Fire	Rounds Fired Rapid Fire	Gun Elevation (Deg/Min)		Bore Enlargement Origin (in)	Bore Enlargement Muzzle (in)	Bore Erosion Gauge Reading (in)	Charge Type	Mean(1) Chamber Pressure ± Std Dev (tsi)(Cu)	Mean(1) Trunnion Velocity ± Std Dev (ft/sec)	Mean Rate of Fire (R/M)	Mean(1) Uncorr Range ± Std Dev (yds)	Mean(1) Corr Range ± Std Dev (yds)	Range Table Range (yds)	Uncorr D/R(1) (%)	Corr D/R(1) (%)
	Rate of Fire	-	11	27	00				Full	N.T	2685±14	12.24	25707±256	26213±131	25500	.78	.43
	Clearing Charge	1	-	27	00				Reduced	N.T						-	-
12/08	Step Load	-	15	27	00	N.T	N.T	N.T.	Full	N.T	2681±17	3.65	24964±250	26041±169	25500	.76	.49
	Clearing Charge	1	-	27	00				Reduced	N.T.	-	-	-	-	-	-	-
	Rate of Fire	-	15	45	00				Reduced	N.T	2160±13	12.45	23042±156	23915±185	23412	.48	.56
	Rate of Fire	-	6	45	00				Reduced	N.T.		12.51					
	Rate of Fire	-	9	45	00					N.T.	2156±12	12.49	23018±179	23945±281	23412	.63	.93
12/13	Spotting Round	1	-	20	00	.065	.018	-0.58	Full	N.T		-					
	Fire-out		37	20	00				Full	N.T	2691±16	12.07	2[illegible]60±216	22592±101	22200	.74	.36
	Step Load	-	14	19	30				Full	N.T.	2676±11	3.35	21861±237	22269±170	21937	.74	.59
	Clearing Charge	1	-	19	30				Full			-					
	Step Load	-	20	19	30				Full			3.02					
		2	-	19	30				Full	N.T	2674±15	-	2[illegible]315±203	22249±148	21937	.74	.53
12/15	Selectability	-	15	12	00	N.T	N.T.	N.T.	Full	N.T	N.T	N.T	N.T	-			-
12/16	Selectability	-	15	OSC.		N.T.	N.T	N.T.	Full	N.T	N.T	4.93(4)	N.T	-	-		-
	Rate of Fire	-	14	35	00				Reduced	N.T	2168±7	12.57	22806±[illegible]	22200±105	22100	.47	.40
	Clearing Charge	1	-	35	00				Reduced	N.T	2183	-	23074	22282	22210	-	-
	Rate of Fire	-	15	35	00				Reduced	N.T	2167±12	12.55	22818±165	22214±71	22100	.56	.25
12/22	Clearing Charge	1	-	66	00	.084	.026	2.63	Reduced	N.T	2168	-	19438	20188	20620	-	-
	Rate of Fire	-	14	60	00				Reduced	N.T.	2140±19	11.99	20120±137	21230±224	20620	.46	.74
12/23	Clearing Charge	1	-			N.T	N.T.	N.T.	Reduced	N.T	N.T.	-	N.T.	-	-	-	-
12/27	-		-	-		.084	.026	2.75	-	-	-	-	-	-	-	-	-

(1) The first round of each group was considered a conditioning round and not used in the analysis of data.
(2) All four bursts are considered one group for data analysis because delays were a half hour or less between bursts.
(3) Bore erosion gauge readings were taken on the 5X 25 MOD 1 [illegible] only. Negative readings indicate the erosion gauge did not go far enough into the bore for the zero inch mark on the erosion gauge scale to reach the plane of the breech face. The 8-inch bore erosion gauge MARK 2 MOD 0 was used (dwg. 507079).
(4) Rates of fire for selectability tests indicate rather long pauses when the drum was indexing to a clip loaded with the selected ammunition type.
(5) Maladjusted photocell sensitivities caused a slow rate of fire.
(6) Purposes of the tests during the OPEVAL are simplified for compatibility with this table.
(7) Rate of fire was low due to the last three drum index times being about one second too long. This was believed caused by an oil film on the light source which is used to indicate cell one at transfer station.
N.T. Not taken.
OSC Mount was oscillating in elevation.

TABLE G-2
8"/55 MAJOR CALIBER LIGHTWEIGHT GUN MOUNT MARK 71 MOD 0
TABULATION OF BALLISTIC DATA

DATE FIRED 1971	BARREL CO-ORD	ROUND NO.	TOTAL EFC FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE EROSION ORIGIN (IN.)	BORE EROSION MUZZLE (IN.)	REAR EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (TSI)	TRUN. VEL. (F/S)	MUZZLE FLASH (JND/ CM.SC.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
09/03	20-9	1	1354	13 30	SLOW	.003	.001	N.T.	NOSIHAAJ766	60.33	14.9	2390	N.T.	N.T.	-	-
		2	1410							65.03	15.4	2460	N.T.	N.T.	-	-
		3	1427							70.03	19.9	2584	N.T.	N.T.	-	-
		4	1457	45 30						75.32	21.9	2727	N.T.	N.T.	-	-
		5	1579							79.18	24.1	2912	N.T.	N.T.	-	-
		6	1532							63.29	15.4	2668	N.T.	N.T.	-	-
09/08	20-8	1	[illegible]	15 30	SLOW	.003	.000	N.T.	SPCF-11873	82.63	16.9	2737	N.T.	N.T.	-	-
		2	1512							82.53	17.4	2748	N.T.	N.T.	-	-
		3	1527							82.67	19.7	2766	N.T.	N.T.	-	-
		4	1591							82.63	18.5	2768	N.T.	N.T.	-	-
		5	1510							82.55	19.7	2765	N.T.	N.T.	-	-
		6	1565							82.61	17.5	2727	N.T.	N.T.	-	-
09/13	20-8	1	1597	55 00	SLOW	.005	.001	N.T.	SPCF-11873	67.93	N.T.	2279	N.T.	N.T.	-	-
		2	1602							67.30	N.T.	2260	N.T.	N.T.	-	-
		3	1601							67.60	N.T.	2273	N.T.	N.T.	-	-
		4	1618		RAPID					67.80	N.T.	2262	N.T.	N.T.	-	-
		5								67.89	N.T.	2259	N.T.	N.T.	-	-
		6								67.88	N.T.	2239	N.T.	N.T.	-	-
		7								67.86	N.T.	2236	N.T.	N.T.	-	-
		8								67.60	N.T.	2261	N.T.	N.T.	-	-
		9								67.73	N.T.	2255	N.T.	N.T.	-	-
		10								67.93	N.T.	2246	N.T.	N.T.	-	-
		11								67.96	N.T.	2257	N.T.	N.T.	-	-
		12								67.80	N.T.	2229	N.T.	N.T.	-	-
09/14	20-8	1	1122	10 00	RAPID	.000	.002	N.T.	SPCF-11873	67.88	N.T.	N.T.	N.T.	N.T.	-	-
		2								67.89	N.T.	N.T.	N.T.	N.T.	-	-
		3								67.80	N.T.	N.T.	N.T.	N.T.	-	-
		4								67.89	N.T.	N.T.	N.T.	N.T.	-	-
		5								[illegible]	N.T.	N.T.	N.T.	N.T.	-	-
09/15	20-3	1	1774	16 00	SLOW	.005	.001	N.T.	NOSIHAAJ3-6	65.29	14.9	2452	N.T.	N.T.	-	-
		2	1746							77.93	23.8	2914	N.T.	N.T.	-	-
		3	1359							77.93	26.5	2896	N.T.	N.T.	-	-
09/16	20-8	1	1619	16 30	SLOW	N.T.	N.T.	N.T.	SPCF-11873	82.53	N.T.	2717	N.T.	N.T.	-	-
		2	1676							82.57	N.T.	2771	N.T.	N.T.	-	-
		3	1676							82.53	N.T.	2706	N.T.	N.T.	-	-
		4	1637		RAPID					82.63	N.T.	2767	N.T.	N.T.	-	-
		5								82.61	N.T.	2775	N.T.	N.T.	-	-
		6								82.61	N.T.	2698	N.T.	N.T.	-	-
		7								82.63	N.T.	2694	N.T.	N.T.	-	-
		8								82.63	N.T.	2646	N.T.	N.T.	-	-
		9								82.63	N.T.	2729	N.T.	N.T.	-	-
		10								82.63	N.T.	2716	N.T.	N.T.	-	-
		11								82.53	N.T.	2716	N.T.	N.T.	-	-
		12								82.63	N.T.	2698	N.T.	N.T.	-	-
09/17	20-8	1	1016	13 00	SLOW	.004	.002	N.T.	SPCF-11873	82.63	N.T.	2630	N.T.	N.T.	-	-

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
09/17	20-8	2	1018	10 30	SLOW	.008	.032	N.T.	SPCF-11073	82.63	N.T.	2740	N.T.	N.T.	-	-
		3	1023							82.63	N.T.	2695	N.T.	N.T.	-	-
		4	1027		RAPID					82.63	N.T.	2727	N.T.	N.T.	-	-
		5								82.63	N.T.	2694	N.T.	N.T.	-	-
		6								82.63	N.T.	2730	N.T.	N.T.	-	-
		7								82.63	N.T.	2739	N.T.	N.T.	-	-
		8								82.63	N.T.	2718	N.T.	N.T.	-	-
		9	1030		SLOW				NOSIHAJ346	77.90	24.3	2934	N.T.	N.T.	-	-
		10	1037							77.80	23.4	2905	N.T.	N.T.	-	-
		11	1044							77.80	23.7	2906	N.T.	N.T.	-	-
		12	1047						SPCF-11073	82.63	N.T.	2720	N.T.	N.T.	-	-
09/27	10-8	1	1437	00 30	RAPID	.012	.032	N.T.	SPCF-11073	82.63	N.T.	2694	N.T.	N.T.	-	-
		2								82.63	N.T.	2739	N.T.	N.T.		-
		3								82.63	N.T.	2712	N.T.	N.T.	-	-
		4								82.63	N.T.	2715	N.T.	N.T.	-	-
		5								82.63	N.T.	2694	N.T.	N.T.	-	-
		6								82.63	N.T.	2697	N.T.	N.T.	-	-
		7								82.63	N.T.	2724	N.T.	N.T.	-	-
		8								82.63	N.T.	2706	N.T.	N.T.	-	-
		9								82.63	N.T.	2719	N.T.	N.T.	-	-
		10								82.63	N.T.	(1)	N.T.	N.T.	-	-
		11								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		12	1500							82.63	N.T.	N.T.	N.T.	N.T.	-	-
		13								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		14								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		15								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		16								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		17								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		18								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		19								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		20								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		21								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		22								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		23								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		24								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		25								82.63	N.T.	N.T.	N.T.	N.T.	-	-
09/28	20-8	1	1350	10 30	RAPID	.014	.032	N.T.	SPCF-11073	82.63	N.T.	N.T.	N.T.	N.T.	-	-
		2								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		3								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		4								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		5								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		6								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		7								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		8								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		9								82.63	N.T.	N.T.	N.T.	N.T.	-	-

TABLE G-2 (Continued)

DATE FIRED 971	BARREL EX-NO.	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	[illegible] DES.G.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
09/20	20-0	10		10 30	RAPID	.014	.003	N.T.	SPCF-11073	92.63	N.T.	N.T.	N.T.	N.T.	-	-
		11								92.63	N.T.	N.T.	N.T.	N.T.	-	-
		12								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		13	1473	20 00	SLOW					92.63	N.T.	N.T.	N.T.	N.T.	-	-
		14	1536		RAPID					82.63	N.T.	N.T.	N.T.	N.T.	-	-
		15								92.63	N.T.	N.T.	N.T.	N.T.	-	-
		16	1519							92.63	N.T.	N.T.	N.T.	N.T.	-	-
		17								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		18	1520							82.63	N.T.	N.T.	N.T.	N.T.	-	-
		19								92.63	N.T.	N.T.	N.T.	N.T.	-	-
		20								42.63	N.T.	N.T.	N.T.	N.T.	-	-
10/04	20-0	1	1537	00 30	SLOW	.022	.003	N.T.	SPCF-11073	92.63	N.T.	2799	0	N.T.	-	-
		2	1527							82.63	N.T.	2750	0	N.T.	-	-
		3	1559							82.63	N.T.	2776	0	N.T.	-	-
		4	1546							82.63	N.T.	2798	0	N.T.	-	-
		5	1553							82.63	N.T.	2793	0	N.T.	-	-
10/06	20-0	1	1010	00 30	SLOW	N.T.	N.T.	N.T.	SPCF-11073	67.00	N.T.	2316	0	N.T.	-	-
		2	1040							82.63	N.T.	2751	0	N.T.	-	-
		3	1054							82.63	N.T.	2724	0	N.T.	-	-
		4	1417							82.63	N.T.	2731	0	N.T.	-	-
		5	1415							92.63	N.T.	2757	0	N.T.	-	-
		6	1426							82.63	N.T.	2776	0	N.T.	-	-
		7	1549						NOSIHAJ346	77.90	23.9	2827	(2)	N.T.	-	-
10/07	20-0	1	1320	00 30	SLOW	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	2649	0	N.T.	-	-
		2	1455							82.63	N.T.	2770	0	N.T.	-	-
		3	1534							82.63	N.T.	2707	0	N.T.	-	-
		4	1511							82.63	N.T.	2737	0	N.T.	-	-
		5	1519							82.63	N.T.	2711	N.T.	N.T.	-	-
10/08	20-0	1	N.T.	03 30	SLOW	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	N.T.	N.T.	N.T.	-	-
		2	N.T.						NOSIHAJ346	77.90	24.1	N.T.	N.T.	N.T.	-	-
10/12	20-0	-	-	-	-	.024	.004	N.T.	-	-	-	-	-	-	-	-
10/13	20-1	1	1426	10 00	SLOW	.002	.033	N.T.	NOSIHAJ346	60.03	15.2	2325	N.T.	N.T.	-	-
		2	1445							55.03	15.0	2449	N.T.	N.T.	-	-
		3	1435							73.03	18.5	2598	N.T.	N.T.	-	-
		4	1535							75.03	21.6	2776	N.T.	N.T.	-	-
		5	1559							74.00	23.2	2803	N.T.	N.T.	-	-
10/16	20-1	1	1535	10 09	SLOW	.001	.002	N.T.	NOSIHAJ346	65.30	15.8	N.T.	N.T.	N.T.	-	-
10/22	20-1	1	1474	13 03	SLOW	N.T.	N.T.	N.T.	SPCF-11073	67.00	N.T.	2240	N.T.	N.T.	-	-
		2	1505							67.00	N.T.	2229	N.T.	N.T.	-	-
		3	1506							67.00	N.T.	2208	N.T.	N.T.	-	-
		4	1517							67.00	N.T.	2220	N.T.	N.T.	-	-
		5	1510							67.03	N.T.	2239	N.T.	N.T.	-	-
		6	1510							67.00	N.T.	2236	N.T.	N.T.	-	-
11/02	20-1	1	1046	03 03	SLOW	.005	.031	-4.67	SPCF-11073	82.63	N.T.	2721	N.T.	6712	6456	6512
		2	1056							82.63	N.T.	2750	N.T.	6776	6392	6512

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UN/CM.SC.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/02	28-1	3	1059	83 33	SLOW	.005	.001	-4.67	SPCF-11073	82.63	N.T.	2729	N.T.	6664	6373	6512
		4	1428	13 08	RAPID					82.63	N.T.	2716	N.T.	15727	15376	15336
		5								82.63	N.T.	2734	N.T.	15566	15321	15336
		6								82.63	N.T.	2717	N.T.	15452	15092	15336
		7								82.63	N.T.	2680	N.T.	15732	15698	15336
		8								82.63	N.T.	2709	N.T.	15732	15443	15336
		9								82.63	N.T.	2597	N.T.	15656	15472	15336
		10								82.63	N.T.	2702	N.T.	15819	15590	15336
		11								82.63	N.T.	2695	N.T.	15630	15464	15336
		12								82.63	N.T.	2710	N.T.	15605	15307	15336
		13								82.63	N.T.	2715	N.T.	15612	15270	15336
		14								82.63	N.T.	2695	N.T.	15696	15530	15336
		15								82.63	N.T.	2698	N.T.*	15487	15382	15336
11/04	28-1	1	1010	00 38	SLOW	.003	.002	-4.63	SPCF-11073	60.00	N.T.	2006	N.T.	N.T.	-	-
		2	1101							63.00	N.T.	2127	N.T.	N.T.	-	-
		3	1110							65.00	N.T.	2190	N.T.	N.T.	-	-
		4	1117							67.00	N.T.	2253	N.T.	N.T.	-	-
		5	1122							68.50	N.T.	2296	N.T.	N.T.	-	-
		6	1127							70.00	N.T.	2379	N.T.	N.T.	-	-
		7	1425	20 50	RAPID					82.63	N.T.	2717	N.T.	22710	22869	22200
		8								82.63	N.T.	2692	N.T.	22433	22892	22200
		9								82.63	N.T.	2715	N.T.	22595	22776	22200
		10								82.63	N.T.	2714	N.T.	22457	23052	22200
		11								82.63	N.T.	2712	N.T.	22751	22970	22200
		12								82.63	N.T.	2739	N.T.	22932	22728	22200
		13								82.63	N.T.	2706	N.T.	22575	22866	22200
		14								82.63	N.T.	2700	N.T.	22385	22652	22200
		15								82.63	N.T.	2700	N.T.	22409	22772	22200
		16								82.63	N.T.	2714	N.T.	22424	22619	22200
		17	1455		SLOW					82.63	N.T.	2706	N.T.	22470	-	-
		18	1514							82.63	N.T.	2710	N.T.	22543	-	-
11/06	28-1	1	1541	30 35	RAPID	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	N.T.	N.T.	N.T.	-	-
		2								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		3								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		4								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		5								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		6								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		7								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		8								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		9								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		10								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		11								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		12								82.63	N.T.	N.T.	N.T.	N.T.	-	-
11/09	28-1	1	1421	18 03	RAPID	.008	.002	-4.60	SPCF-11073	82.63	N.T.	2691	0	14975	15418	15335
		2								82.63	N.T.	2716	0	15394	15317	15336

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UN/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/09	28-1	3		18 00	RAPID	.900	.002	-4.60	SPCF-11873	82.63	N.T.	2710	0	15175	15450	15336
		4								82.63	N.T.	2706	0	15067	15378	15336
		5								82.63	N.T.	2693	0	15065	15491	15336
		6								82.63	N.T.	2715	0	15213	15444	15336
		7								82.63	N.T.	2712	0	15249	15506	15336
		8								82.63	N.T.	2697	0	15138	15528	15336
		9								82.63	N.T.	2635	243	15009	15407	15336
		10								82.63	N.T.	2709	0	15161	15445	15336
		11								82.63	N.T.	2799	0	15110	15394	15336
		12								82.63	N.T.	2709	1626	15350	15634	15336
		13								82.63	N.T.	2799	1626	14992	15276	15336
		14								82.63	N.T.	2694	1626	15033	15449	15336
		15								82.63	N.T.	2710	1628	15112	15387	15336
		16								82.63	N.T.	2703	1791	15052	15389	15336
		17								82.63	N.T.	2718	1988	15062	15357	15336
		18								82.63	N.T.	2698	1791	15125	15506	15336
		19								82.63	N.T.	2700	1626	15068	15431	15336
		20	1455		SLOW					82.63	N.T.	2702	0	15046	15381	15336
11/12	28-1	1	1112	18 30	RAPID	.911	.306	-4.45	SPCF-11873	82.63	N.T.	2698	0	15248	15360	15336
		2								82.63	N.T.	2725	0	15545	15401	15336
		3								82.63	N.T.	2707	0	15423	15436	15336
		4								82.63	N.T.	2715	390	15433	15377	15336
		5								82.63	N.T.	2732	0	15484	15278	15335
		6								82.63	N.T.	2717	0	15395	15321	15336
		7								82.63	N.T.	2704	0	15455	15498	15336
		8								82.63	N.T.	2706	0	15399	15421	15336
		9								82.63	N.T.	2721	0	15527	15418	15336
		10								82.63	N.T.	2716	785	15466	15401	15336
		11								82.63	N.T.	2797	0	15349	15362	15336
		12								82.63	N.T.	2707	0	15290	15303	15336
		13								82.63	N.T.	2710	0	15337	15325	15336
		14								82.63	N.T.	2702	912	15433	15490	15336
		15								82.63	N.T.	2712	0	15427	15397	15336
		16								82.63	N.T.	2697	912	15299	15408	15336
		17								82.63	N.T.	2711	522	15419	15398	15336
		18								82.63	N.T.	2779	1043	15493	15314	15336
		19								82.63	N.T.	2724	0	15542	15407	15336
		20								82.63	N.T.	2714	795	15343	15296	15336
		21								82.63	N.T.	2699	785	15202	15286	15336
		22								82.63	N.T.	2681	522	15123	15365	15336
		23								82.63	N.T.	2705	1175	15337	15368	15336
		24								82.63	N.T.	2709	912	15494	15481	15336
		25								82.63	N.T.	2730	1043	15332	15407	15336
		26								82.63	N.T.	2719	795	15449	15358	15336
		27	1116							82.63	N.T.	2692	912	15420	15565	15336

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-NOC	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UN/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/12	28-1	28		13 33	RAPID	.011	.334	-4.45	SPCF-11973	82.63	N.T.	2707	1343	15401	15314	15336
		29								82.63	N.T.	2694	[illegible]	15149	15364	15336
		30								82.63	N.T.	2707	522	15482	15495	15336
		31								82.63	N.T.	2695	522	15148	15355	15336
		32								82.63	N.T.	2649	785	15153	15234	15336
		33								82.63	N.T.	2638	785	15371	15463	15336
		34								82.63	N.T.	2699	912	15163	15335	15336
		35								82.63	N.T.	2693	1043	15162	15346	15336
		36								82.63	N.T.	2721	912	15387	15278	15336
		37								82.63	N.T.	2704	522	15241	15281	15336
		38								82.63	N.T.	2698	912	15199	15362	15336
		39								82.63	N.T.	2719	912	15423	15348	15336
		40								82.63	N.T.	2677	912	15117	15394	15336
		41								82.63	N.T.	2693	785	15213	15349	15336
		42								82.63	N.T.	2714	1175	15405	15358	15336
		43								82.63	N.T.	2693	1175	15154	15378	15336
		44								82.63	N.T.	2711	1043	15383	15362	15336
		45								82.63	N.T.	2702	390	15154	15211	15336
		46								82.63	N.T.	2672	1175	15152	15473	15336
		47								82.63	N.T.	2697	1043	15165	15354	15336
		48	1117							82.63	N.T.	2673	1175	14972	15284	15336
		49								82.63	N.T.	2714	390	15335	15278	15336
		50								82.63	N.T.	2697	390	15169	15279	15336
		51								82.63	N.T.	2672	785	15011	15332	15336
		52								82.63	N.T.	2702	522	15255	15312	15336
		53								82.63	N.T.	2691	1175	15163	15317	15336
		54								82.63	N.T.	2707	390	15219	15232	15336
		55								82.63	N.T.	2700	261	15122	15197	15336
		56								82.63	N.T.	2737	390	15263	15320	15336
		57								82.63	N.T.	2712	522	15144	15154	15336
		58								82.63	N.T.	2679	649	15135	15453	15336
		59								82.63	N.T.	2710	522	15337	15325	15336
		60								82.63	N.T.	2701	522	15224	15290	15336
		61								82.63	N.T.	2704	912	15220	15269	15336
		62								82.63	N.T.	2705	522	15207	15239	15336
		63								82.63	N.T.	2696	649	15160	15270	15336
		64								82.63	N.T.	2697	1175	15136	15272	15336
		65								82.63	N.T.	2695	785	15124	15243	15336
		66								82.63	N.T.	2665	912	15098	15461	15336
		67								82.63	N.T.	2691	785	15165	15319	15336
		68								82.63	N.T.	2690	912	15100	15263	15336
		69								82.63	N.T.	2679	785	15147	15407	15336
		70								82.63	N.T.	2700	785	15199	15274	15336
		71								82.63	N.T.	2698	785	15222	15314	15336
		72								82.63	N.T.	2739	522	15176	15173	15336

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MJO	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (PSI) (CU)	PROJ. VEL. (F/S)	MUZZLE FLASH (UW/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/12	28-1	73		13 00	RAPID	.011	.034	-4.45	SPCF-11073	82.63	N.T.	2691	1043	15232	15474	15336
		74	1141							82.63	N.T.	2497	390	15147	15248	15336
		75								82.63	N.T.	2683	745	15141	15325	15336
11/16	28-1	1	1332	27 39	RAPID	.348	.313	-3.37	SPCF-11073	82.63	N.T.	2646	0	25661	26033	25500
		2								82.63	N.T.	2697	0	26409	25249	25500
		3								82.63	N.T.	2695	0	26548	26232	25500
		4								82.63	N.T.	2725	0	26672	26018	25500
		5								82.63	N.T.	2677	0	25950	25920	25500
		6								82.63	N.T.	2711	912	26479	26007	25500
		7								82.63	N.T.	2638	522	26455	26152	25500
		8								82.63	N.T.	2733	0	26403	26035	25500
		9								82.63	N.T.	2637	766	26153	25993	25500
		10								82.63	N.T.	2692	522	26159	25934	25500
		11								82.63	N.T.	2691	0	26021	25939	25500
		12								82.63	N.T.	2669	0	25923	25993	25500
11/22	28-1	1	1227	84 00	RAPID	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	2652	0	13669	13635	13400
		2								82.63	N.T.	2674	0	13165	13555	13400
		3								82.63	N.T.	2665	0	13236	13698	13400
		4								82.63	N.T.	2664	0	13135	13605	13400
		5								82.63	N.T.	2597	0	13274	13560	13400
		6								82.63	N.T.	2687	0	13225	13511	13400
		7								82.63	N.T.	2476	0	13169	13542	13400
		8								82.63	N.T.	2684	0	13267	13577	13400
		9								82.63	N.T.	2689	390	13231	13501	13400
		10								82.63	N.T.	2677	261	13211	13577	13400
		11								82.63	N.T.	2670	649	13113	13463	13400
		12								82.63	N.T.	2606	0	13145	13599	13400
		13								82.63	N.T.	2656	0	12953	13495	13400
		14								82.63	N.T.	2673	649	13121	13519	13400
		15								82.63	N.T.	2599	522	13196	13536	13400
		16	1337							82.63	N.T.	2698	0	13267	13465	13400
		17								82.63	N.T.	2661	0	13106	13680	13400
		18								82.63	N.T.	2676	0	13104	13478	13400
		19								82.63	N.T.	2649	0	13154	13496	13400
		20								82.63	N.T.	2556	0	12934	13468	13400
		21								82.63	N.T.	2653	0	12949	13557	13400
		22								82.63	N.T.	2655	0	13028	13490	13400
		23								82.63	N.T.	2658	912	12891	13729	13400
		24								82.63	N.T.	2679	0	13115	13465	13400
		25								82.63	N.T.	2679	0	13046	13396	13400
		26								82.63	N.T.	2677	0	13149	13515	13400
		27								82.63	N.T.	2661	0	12892	13386	13400
		28								82.63	N.T.	2678	0	13070	13378	13400
		29								82.63	N.T.	2710	765	13429	13531	13400
		30								82.63	N.T.	(2)	522	13351	-	-

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/22	24-1	31		29 39	RAPID	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	2642	0	13272	13540	13400
		32								82.63	N.T.	2697	522	13203	13446	13400
		33								82.63	N.T.	2673	0	13176	13787	13400
11/23	24-1	1	1059	27 39	RAPID	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	2737	0	(3)	-	-
		2								82.63	N.T.	2698	0	(3)	-	-
		3								82.63	N.T.	2717	0	25676	25976	25500
		4								82.63	N.T.	2701	0	25552	26080	25500
		5								82.63	N.T.	2644	0	25734	26143	25500
		6								82.63	N.T.	2698	649	25404	26141	25500
		7								82.63	N.T.	2686	0	25383	26196	25500
		8								82.63	N.T.	2703	0	25743	26245	25500
		9								82.63	N.T.	2695	0	25023	26229	25500
		10								82.63	N.T.	2729	0	25669	25652	25500
		11								82.63	N.T.	2670	0	25111	26042	25500
		12								82.63	N.T.	2690	0	25346	26017	25500
		13								82.63	N.T.	2705	522	25610	26086	25500
		14								82.63	N.T.	2689	522	25473	26157	25500
		15								82.63	N.T.	2679	261	25172	25906	25500
		16	1414	DSC.						82.63	N.T.	N.T.	0	N.T.	-	-
		17								82.63	N.T.	N.T.	0	N.T.	-	-
		18								82.63	N.T.	N.T.	0	N.T.	-	-
		19								82.63	N.T.	N.T.	0	N.T.	-	-
		20								82.63	N.T.	N.T.	0	N.T.	-	-
11/30	24-1	1	0954	28 09	RAPID	.136	.017	-2.78	SPCF-11073	82.63	N.T.	2670	0	13191	13457	13400
		2								82.63	N.T.	2723	1175	13636	13539	13400
		3								82.63	N.T.	2689	0	13255	13369	13400
		4								82.63	N.T.	2685	390	13217	13363	13400
		5								82.63	N.T.	2673	649	13104	13406	13400
		6								82.63	N.T.	2693	0	13267	13349	13400
		7								82.63	N.T.	2741	0	13776	13294	13400
		8								82.63	N.T.	2699	261	13409	13443	13400
		9								82.63	N.T.	2737	390	13494	13465	13400
		10								82.63	N.T.	2637	261	13168	13353	13400
		11								82.63	N.T.	2714	0	13344	13259	13400
		12								82.63	N.T.	2656	390	12944	13366	13400
		13								82.63	N.T.	2717	261	13496	13427	13400
		14								82.63	N.T.	2665	0	13194	13503	13400
		15								82.63	N.T.	2645	0	13173	13319	13400
		16	1317	DSC.						82.63	N.T.	N.T.	N.T.	N.T.	-	-
		17								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		18								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		19								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		20								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		21								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		22								82.63	N.T.	N.T.	N.T.	N.T.	-	-

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
11/30	28-1	23		OSC.	RAPID	.134	.017	-2.78	SPCF-11873	82.63	N.T.	N.T.	N.T.	N.T.	-	-
		24								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		25								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		26								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		27								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		28								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		29								82.63	N.T.	N.T.	N.T.	N.T.	-	-
		30								82.63	N.T.	N.T.	N.T.	N.T.	-	-
12/01	28-1	1	1149	27 08	RAPID	N.T.	N.T.	N.T.	SPCF-11873	82.63	N.T.	2634	0	25778	26024	25500
		2								82.63	N.T.	2690	0	25891	26239	25500
		3								82.63	N.T.	2680	390	25215	25693	25500
		4								82.63	N.T.	2685	572	25809	26722	25500
		5								82.63	N.T.	2630	0	25598	26376	25500
		6								82.63	N.T.	2705	912	25900	26137	25500
		7								82.63	N.T.	2694	649	25772	26069	25500
		8								82.63	N.T.	2692	0	25829	26151	25500
		9								82.63	N.T.	2700	912	25796	26016	25500
		10								82.63	N.T.	2691	1043	25749	26084	25500
		11								82.63	N.T.	2632	649	25740	26070	25500
		12								82.63	N.T.	2693	0	25751	26060	25500
		13								82.63	N.T.	2677	0	25407	25924	25500
		14								82.63	N.T.	2692	522	25816	26139	25500
		15								82.63	N.T.	2678	1043	25507	26011	25500
		16	1202		SLOW					82.63	N.T.	2723	0	26170	26129	25500
		17	1214							82.63	N.T.	2670	0	25437	26040	25500
		18	1414		RAPID					82.63	N.T.	2729	0	26534	26470	25500
		19								82.63	N.T.	2691	390	25932	26761	25500
		20								82.63	N.T.	2694	0	25850	26248	25500
		21								82.63	N.T.	2697	0	25839	26233	25500
		22								82.63	N.T.	2679	390	25546	26131	25500
		23								82.63	N.T.	2731	261	26362	26361	25500
		24								82.63	N.T.	2691	0	25669	26419	25500
		25								82.63	N.T.	2651	785	25165	26116	25500
		26								82.63	N.T.	2687	522	25610	26111	25500
		27								82.63	N.T.	2693	0	25561	26094	25500
		28								82.63	N.T.	2691	785	25627	26056	25500
		29	N.T.		SLOW					66.97	N.T.	N.T.	0	N.T.	-	-
12/03	28-1	1	1051	27 33	RAPID	N.T.	N.T.	N.T.	SPCF-11073	82.63	N.T.	2666	0	24598	25890	25500
		2								82.63	N.T.	[illegible]	0	25386	-	-
		3								82.63	N.T.	2656	0	24890	26206	25500
		4								82.63	N.T.	2680	522	24815	26159	25500
		5								82.63	N.T.	2732	0	25349	26147	25500
		6								82.63	N.T.	2697	0	25136	25999	25500
		7								82.63	N.T.	2675	522	24947	26096	25500
		8								82.63	N.T.	2634	0	24995	25897	25500

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	TOTAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/03	20-1	9		27 30	RAPID	N.T.	N.T.	N.T.	SPCF-11373	82.63	N.T.	2692	0	25195	26033	25500
		10								82.63	N.T.	2739	0	25339	26846	25500
		11								82.63	N.T.	2647	649	24933	26051	25500
		12								82.63	N.T.	2566	0	25070	26736	25500
		13								82.63	N.T.	2652	0	24638	25816	25500
		14								82.63	N.T.	2670	0	24777	25913	25500
		15								82.63	N.T.	2676	0	24643	25759	25500
		16	1653		SLOW					66.07	N.T.	N.T.	N.T.	N.T.	-	-
		17	1121	45 30	RAPID					66.07	N.T.	2139	390	22700	23867	23412
		18								66.07	N.T.	2151	1307	22741	23740	23412
		19								66.07	N.T.	2174	0	22919	23596	23412
		20								66.07	N.T.	2151	0	23191	24180	23412
		21								66.07	N.T.	2161	0	23374	23933	23412
		22								66.07	N.T.	2149	0	23119	23712	23412
		23								66.07	N.T.	2155	0	23034	23977	23412
		24								66.07	N.T.	2164	0	23338	23855	23412
		25								66.07	N.T.	2144	0	22766	23863	23412
		26								66.07	N.T.	2150	0	23087	24020	23412
		27								66.07	N.T.	2155	0	23349	23851	23412
		28								66.07	N.T.	2175	0	23194	23862	23412
		29								66.07	N.T.	2158	0	23022	23965	23412
		30								66.07	N.T.	2137	0	23131	24325	23412
		31								66.07	N.T.	2178	0	23314	23939	23412
		32	1148							66.07	N.T.	2149	964	22689	23716	23412
		33								66.07	N.T.	2149	0	22912	23959	23412
		34								66.07	N.T.	2131	912	23259	24538	23412
		35								66.07	N.T.	2163	0	22435	23666	23412
		36								66.07	N.T.	2146	0	23042	24189	23412
		37								66.07	N.T.	2150	0	23006	24019	23412
		38	1142							66.07	N.T.	2154	0	23065	24022	23412
		39								66.07	N.T.	2176	0	22965	23614	23412
		40								66.07	N.T.	2155	649	22958	23801	23412
		41								66.07	N.T.	2159	522	23175	24062	23412
		42								66.07	N.T.	2170	0	23072	23805	23412
		43								66.07	N.T.	2142	0	23256	24341	23412
		44								66.07	N.T.	2170	0	23076	23509	23412
		45								66.07	N.T.	2167	0	22764	23539	23412
		46								66.07	N.T.	2153	0	23247	24074	23412
12/13	20-1	1	1297	25 48	SLOW	.865	.818	-8.54	SPCF-11373	82.63	N.T.	2647	0	22042	22456	22200
		2	1216		RAPID					82.63	N.T.	2701	0	22762	22758	22200
		3								82.63	N.T.	2699	390	22590	22520	22200
		4								82.63	N.T.	2596	0	22424	22494	22200
		5								82.63	N.T.	2647	0	22327	22591	22200
		6								82.63	N.T.	2697	0	22312	22486	22200
		7								82.63	N.T.	2674	785	22302	22584	22200

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/13	29-1	8		28 48	RAPID	.365	.018	-0.58	SPCF-11873	42.63	N.T.	2701	522	22733	22739	22200
		9								42.63	N.T.	2673	649	22221	22563	22200
		10								42.63	N.T.	2630	0	22356	22494	22200
		11								42.63	N.T.	2630	261	22316	22358	22200
		12								42.63	N.T.	2736	649	22618	22555	22200
		13								42.63	N.T.	2693	745	22353	22491	22200
		14								42.63	N.T.	2494	0	22342	22384	22200
		15								42.63	N.T.	2711	735	22628	22515	22200
		16								42.63	N.T.	2709	649	22711	22634	22200
		17								42.63	N.T.	2669	745	22202	22592	22200
		18								42.63	N.T.	2687	0	22477	22651	22200
		19								42.63	N.T.	2728	0	23053	22776	22200
		20								42.63	N.T.	2738	745	22673	22596	22200
		21								42.63	N.T.	2697	649	22621	22675	22200
		22								42.63	N.T.	2647	0	21903	22557	22200
		23								42.63	N.T.	2677	0	22306	22603	22200
		24								42.63	N.T.	2688	0	22494	22686	22200
		25								42.63	N.T.	2642	735	22452	22686	22200
		26								42.63	N.T.	2711	1175	22549	22551	22200
		27								42.63	N.T.	2695	390	22659	22737	22200
		28								42.63	N.T.	2699	1043	22330	22480	22200
		29								42.63	N.T.	2647	912	22401	22575	22200
		30								42.63	N.T.	2642	649	22378	22612	22200
		31								42.63	N.T.	2598	390	22647	22689	22200
		32								42.63	N.T.	2647	649	22495	22717	22200
		33								42.63	N.T.	2698	522	22429	22567	22200
		34								42.63	N.T.	2655	745	22167	22781	22200
		35								42.63	N.T.	(2)	745	21672	-	-
		36								42.63	N.T.	(2)	912	21847	-	-
		37								42.63	N.T.	(2)	649	22193	-	-
		38								42.63	N.T.	(2)	735	22136	-	-
		39	1406	19 38						42.63	N.T.	2704	649	22400	22551	21937
		40								42.63	N.T.	2699	390	22322	22505	21937
		41								42.63	N.T.	2691	0	22027	22382	21937
		42								42.63	N.T.	2679	261	21949	22277	21937
		43								42.63	N.T.	2695	745	21845	22039	21937
		44								42.63	N.T.	2691	0	22217	22572	21937
		45								42.63	N.T.	2682	522	21839	22102	21937
		46								42.63	N.T.	2678	1175	21737	22161	21937
		47								42.63	N.T.	2640	745	21932	22209	21937
		48								42.63	N.T.	2667	912	21846	22362	21937
		49								42.63	N.T.	2654	1175	21451	22117	21937
		50								42.63	N.T.	2674	745	21926	22262	21937
		51								42.63	N.T.	2664	0	21529	22080	21937
		52								42.63	N.T.	2677	0	21770	22229	21937

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	TOTAL RDS. FIRED	GUN ELEVATION (DEG-MIN)	[illegible] SPEED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBR PRESS. (TSI) (PSI)	TRUN. VEL. (F/S)	MUZZLE FLASH (JM/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/13	20-1	53	1636	19 31	SLOW	.365	.318	-0.58	SPCF-11873	42.63	N.T.	2597	785	21954	22243	21937
		54	1636		RAPID					42.63	N.T.	2639	649	22135	22283	21937
		55								42.63	N.T.	2657	0	21961	22293	21937
		56								42.63	N.T.	2676	1043	21716	22140	21937
		57								42.63	N.T.	2684	649	21827	22140	21937
		58								42.63	N.T.	2697	1043	22210	22417	21937
		59								42.63	N.T.	2656	912	22039	22254	21937
		60								42.63	N.T.	2672	649	21992	22301	21937
		61								42.63	N.T.	2654	649	21905	22356	21937
		62								42.63	N.T.	2663	912	21470	21975	21937
		63								42.63	N.T.	2656	912	21672	22318	21937
		64								42.63	N.T.	2673	390*	21932	22249	21937
		65								42.63	N.T.	2645	912	21556	22425	21937
		66								42.63	N.T.	2632	649	21548	22337	21937
		67								42.63	N.T.	(2)	649	21790	-	-
		68								42.63	N.T.	2631	522	21700	21940	21937
		69								42.63	N.T.	2678	785	21979	22369	21937
		70								42.63	N.T.	(2)	785	21891	-	-
		71								42.63	N.T.	(2)	785	21849	-	-
		72								42.63	N.T.	(2)	261	22833	-	-
		73								42.63	N.T.	2666	1043	21568	22096	21937
		74	1647		SLOW					42.63	N.T.	(2)	649	22057	-	-
		75	1646							42.63	N.T.	2684	0	22360	22401	21937
12/15	20-1	1	1653	12 41	RAPID	N.T.	N.T.	N.T.	SPCF-11873	42.63	N.T.	N.T.	N.T.	N.T.	-	-
		2								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		3								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		4								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		5								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		6								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		7								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		8								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		9								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		10								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		11								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		12								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		13								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		14								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		15								42.63	N.T.	N.T.	N.T.	N.T.	-	-
12/16	20-1	1	1955	OSC.	RAPID	N.T.	N.T.	N.T.	SPCF-11873	42.63	N.T.	N.T.	N.T.	N.T.	-	-
		2								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		3								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		4								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		5								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		6								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		7								42.63	N.T.	N.T.	N.T.	N.T.	-	-

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL (EX-MOD)	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRING	BORE [illegible] ORIGIN (IN.)	BORE [illegible] MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/16	20-1	8		OSC.	RAPID	N.T.	N.T.	N.T.	SPCF-11873	42.53	N.T.	N.T.	N.T.	N.T.	-	-
		9								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		10								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		11								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		12								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		13								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		14								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		15								42.63	N.T.	N.T.	N.T.	N.T.	-	-
		16	1632	35 00						66.87	N.T.	2146	0	22991	22163	22100
		17								66.87	N.T.	2173	522	22878	22236	22100
		18								66.87	N.T.	2168	522	22927	22215	22100
		19								66.77	N.T.	2143	649	23365	22309	22100
		20								66.87	N.T.	2159	1175	22632	22120	22100
		21								66.97	N.T.	2157	785	22716	22115	22100
		22								66.87	N.T.	2158	912	22622	22130	22100
		23								66.87	N.T.	2164	0	22794	22140	22100
		24								66.97	N.T.	2158	785	22783	22267	22100
		25								66.87	N.T.	2171	912	22667	22039	22100
		26								66.87	N.T.	2170	785	22955	22319	22100
		27								66.87	N.T.	2165	649	22860	22284	22100
		28								66.87	N.T.	2179	785	22931	22069	22100
		29								66.97	N.T.	2165	649	22956	22378	22100
		30	1636		SLOW					66.07	N.T.	2143	0	23074	22202	22100
		31	1641		RAPID					66.87	N.T.	2171	912	22919	22271	22100
		32								66.97	N.T.	2156	0	22657	22189	22100
		33								66.87	N.T.	2158	0	22618	22118	22100
		34								66.87	N.T.	2146	785	23847	22235	22100
		35								66.87	N.T.	2141	1043	23026	22256	22100
		36								66.97	N.T.	2158	1043	22036	22224	22100
		37								66.37	N.T.	2159	649	22758	22254	22100
		38								65.37	N.T.	2171	0	22875	22227	22100
		39								65.37	N.T.	2146	522	22731	22143	22100
		40								66.87	N.T.	2156	785	22619	22375	22100
		41								66.37	N.T.	2141	0	22955	22107	22100
		42								66.07	N.T.	2194	1343	22918	22114	22100
		43								66.07	N.T.	2159	(2)	22996	22272	22100
		44								66.07	N.T.	2159	(2)	22730	22226	22100
		45								65.97	N.T.	2165	(2)	22456	22123	22100
12/22	29-1	1	1457	43 38	SLOW	.894	.820	-2.67	SPCF-11873	66.27	N.T.	2124	0	(3)	-	-
		2	1535		RAPID					[illegible]	N.T.	2164	522	19634	20224	20620
		3								65.97	N.T.	2143	1561	(3)	-	-
		4								65.97	N.T.	2179	1476	20005	21132	20620
		5								66.07	N.T.	2145	0	20240	21076	20620
		6								65.07	N.T.	2148	795	20129	21134	20620
		7								[illegible]	N.T.	2151	0	20184	21070	20620

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-900	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGEMENT ORIGIN (IN.)	BORE ENLARGEMENT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UM/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/22	28-1	8		68 03	RAPID	.384	N.T.	-2.03	SPCF-110??	66.27	N.T.	2154	4	20159	21091	20620
		9								66.27	N.T.	2143	3	20171	[illegible]	20620
		10								66.27	N.T.	2156	0	20737	[illegible]	20620
		11								66.07	N.T.	2136	0	20004	21233	20620
		12								66.27	N.T.	2114	912	20176	21588	20620
		13								66.37	N.T.	2126	0	19916	21112	20620
		14								66.27	N.T.	2140	3	20147	21157	20620
		15								66.27	N.T.	2137	3	20142	21777	20620
12/23	28-1	1	0915	13 08	SLOW	N.T.	N.T.	N.T.	SPCF-110??	66.27	N.T.	N.T.	N.T.	N.T.	-	-
12/27	28-1	-	-	-		.046	.026	2.75	-	-	-	-	-	OSC.	-	-

NOTES: (1) VELOCITY COILS DAMAGED BY BREAKUP OF PROJECTILE WINDSHIELD.
(2) INSTRUMENTATION FAILURE.
(3) POINT OF IMPACT COULD NOT BE LOCATED WITHIN A REASONABLE TOLERANCE.
(4) OSC. -- OSCILLATING ELEVATION.
(5) N.T. -- NOT TAKEN.

TABLE G-3
8"/55 MAJOR CALIBER LIGHTWEIGHT GUN MOUNT MARK 71 MOD 0
TABULATION OF MOUNT DATA

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (KSI) (CU)	TRAN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CYLINDER STATIC PRESS. (PSI)	COUNTR CYLINDER MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
09/03	20-0	1	01 30	SLOW	PRF.SFR.	14.9	2370	N.T.	N.T.	N.T.	N.T.	21.7	.161	.307	.037	-
		2				15.5	2469	N.T.	N.T.	N.T.	N.T.	25.6	.162	.311	.031	-
		3				19.4	2596	N.T.	N.T.	N.T.	N.T.	27.6	.165	.310	.031	-
		4	05 03			21.4	2777	N.T.	N.T.	N.T.	N.T.	24.5	.163	.334	.028	-
		5				24.1	2812	N.T.	N.T.	N.T.	N.T.	29.6	.163	.340	.028	-
		6				15.4	2643	N.T.	N.T.	N.T.	N.T.	25.6	.169	.326	.036	-
09/08	20-0	1	05 33	SLOW	F[illegible]L	16.0	2707	1370	4670	2259	3653	29.0	N.T.	.313	.029	-
		2				17.4	2748	1389	4550	2219	3750	23.7	N.T.	.319	.036	-
		3				19.7	2746	1380	4540	2158	3538	29.7	N.T.	.314	.029	-
		4				19.5	2743	[illegible]	4569	2193	3624	29.0	N.T.	.297	.033	-
		5				19.1	2745	1308	4783	2193	3538	29.6	N.T.	.333	.032	-
		6				17.5	2722	[illegible]	4793	2238	3593	29.5	N.T.	.323	.031	-
09/13	20-9	1	05 30	SLOW	WR.RED.	N.T.	2270	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	2260	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				N.T.	2271	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		4		RAPID		N.T.	2762	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		5				N.T.	2258	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.81
		6				N.T.	2259	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.11
		7				N.T.	2236	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.19
		8				N.T.	2241	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.00
		9				N.T.	2255	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.00
		10				N.T.	2254	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.10
		11				N.T.	2267	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.62
		12				N.T.	2270	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.00
09/[illegible]	20-0	1	10 30	RAPID	WR.RED.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		2				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		3				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		4				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		5				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
09/15	20-0	1	10 00	SLOW	PRF.SER.	15.9	2467	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				21.1	2610	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				24.5	2836	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
09/16	20-0	1	10 00	SLOW	FULL	N.T.	2717	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	2721	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				N.T.	2796	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		4		RAPID		N.T.	2767	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		5				N.T.	2795	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.71
		6				N.T.	2669	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.02
		7				N.T.	2694	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.40
		8				N.T.	2696	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.01
		9				N.T.	2728	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.00
		10				N.T.	2716	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.48
		11				N.T.	2714	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.01
		12				N.T.	2690	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.00
09/17	20-0	1	10 00	SLOW	FULL	N.T.	2698	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-

TABLE G-2 (Continued)

DATE FIRED 1971	BARREL EX-NO.	ROUND NO.	LOCAL TIME FIRED	GUN ELEVATION (DEG-MIN)	MODE FIRED	BORE ENLARGMT ORIGIN (IN.)	BORE ENLARGMT MUZZLE (IN.)	BORE EROSION GAUGE (IN.)	POWDER INDEX OR DESIG.	CHARGE WEIGHT (LBS)	CHAMBER PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	MUZZLE FLASH (UW/ CM.SQ.)	UNCORR. RANGE (YDS)	CORR. RANGE (YDS)	RANGE TABLE RANGE (YDS)
12/22	28-1	8		60 00	RAPID	.344	N.T.	-2.03	SPCF-11073	66.07	N.T.	2154	0	20159	21091	20620
		9								66.07	N.T.	2143	0	20171	21259	20620
		10								66.07	N.T.	2166	0	20397	21173	20620
		11								66.07	N.T.	2136	0	20064	21230	20620
		12								66.07	N.T.	2114	912	20176	21588	20620
		13								66.07	N.T.	2125	0	19416	21112	20620
		14								66.07	N.T.	2148	0	20147	21157	20620
		15								66.07	N.T.	2133	0	20182	21777	20620
12/23	28-1	1	0935	18 00	SLOW	N.T.	N.T.	N.T.	SPCF-11073	66.07	N.T.	N.T.	N.T.	N.T.	-	-
12/27	28-1	-	-	-		.044	.026	2.75	-	-	-	-	-	N.T.	-	-

NOTES: (1) VELOCITY COILS DAMAGED BY BREAKUP OF PROJECTILE WINDSHIELD.
(2) INSTRUMENTATION FAILURE.
(3) POINT OF IMPACT COULD NOT BE LOCATED WITHIN A REASONABLE TOLERANCE.
(4) OSC. -- OSCILLATING ELEVATION.
(5) N.T. -- NOT TAKEN.

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-NOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (KSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTER CYLINDER STATIC PRESS. (PSI)	COUNTER CYLINDER MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURATION (SEC)	COUNTER RECOIL DURATION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
09/17	28-8	2	10 00	SLOW	FULL	N.T.	2740	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				N.T.	2695	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		4		RAPID		N.T.	2777	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		5				N.T.	2694	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		6				N.T.	2730	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		7				N.T.	2779	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		8				N.T.	2718	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		9		SLOW	PROOF	24.1	2934	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		10				23.4	2485	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	--
		11				23.7	2986	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	--
		12			FULL	N.T.	2720	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
09/27	28-9	1	00 39	RAPID	FULL	N.T.	2694	1563	5200	2180	3630	31.2	.155	.330	.030	-
		2				N.T.	2749	1439	5140	2140	3590	31.8	.170	.310	(1)	4.820
		3				N.T.	2712	1470	5120	2090	3550	32.4	.170	.320	N.T.	6.120
		4				N.T.	2715	1350	4960	2090	3560	32.4	.165	.315	N.T.	7.440
		5				N.T.	2694	1350	4880	2090	3540	32.4	.170	.320	N.T.	7.370
		6				N.T.	2597	1350	4880	2090	3540	32.4	.160	.360	N.T.	28.290
		7				N.T.	2724	1350	4940	2090	3560	32.4	.170	.350	N.T.	26.080
		8				N.T.	2706	1350	4940	2090	3560	32.4	.160	.350	N.T.	38.144
		9				N.T.	2719	1350	4750	2090	3560	32.4	.170	.360	N.T.	18.290
		10				N.T.	(1)	1350	4940	2090	3560	32.4	.175	.345	N.T.	7.500
		11				N.T.	N.T.	1350	5010	2090	3560	32.4	.170	.340	N.T.	7.320
		12				N.T.	N.T.	1350	5010	2090	3560	31.8	.170	.340	.035	-
		13				N.T.	N.T.	1300	4940	2090	3560	31.8	.170	.330	.033	4.790
		14				N.T.	N.T.	1300	4940	2090	3560	32.4	.170	.310	.033	5.180
		15				N.T.	N.T.	1300	4910	2090	3560	32.4	.170	.300	.037	16.630
		16				N.T.	N.T.	1350	4830	2090	3560	32.4	.170	.305	.032	43.010
		17				N.T.	N.T.	1350	5010	2090	3560	32.4	.170	.330	.030	31.440
		18				N.T.	N.T.	1300	4880	2090	3560	32.4	.160	.330	.034	5.210
		19				N.T.	N.T.	1300	4910	2090	3560	32.4	.160	.340	.030	7.340
		20				N.T.	N.T.	1300	4860	2090	3560	32.4	.160	.330	.032	7.220
		21				N.T.	N.T.	1350	4990	2090	3560	32.4	.160	.315	.030	18.020
		22				N.T.	N.T.	1350	4390	2090	3550	32.4	.160	.375	.037	24.510
		23				N.T.	N.T.	1300	4940	2090	3560	32.4	.170	.325	.030	5.080
		24				N.T.	N.T.	1300	4940	2090	3560	32.4	.165	.350	.034	7.400
		25				N.T.	N.T.	1300	4940	2090	3560	32.4	.170	.345	.034	7.230
09/28	28-8	1	10 00	RAPID	FULL	N.T.	N.T.	1570	5050	2190	3500	31.4	.165	.330	.030	-
		2				N.T.	N.T.	1410	4980	2100	3500	31.4	.170	.340	.030	4.670
		3				N.T.	N.T.	1410	5020	2100	3500	31.4	.170	.330	.030	4.960
		4				N.T.	N.T.	1410	4950	2100	3500	31.8	.170	.350	.032	7.860
		5				N.T.	N.T.	1410	4880	2100	3500	32.2	.175	.350	.030	4.980
		6				N.T.	N.T.	1410	4950	2100	3500	32.2	.180	.350	.030	6.400
		7				N.T.	N.T.	1410	4950	2100	3500	32.2	.180	.350	.030	8.700
		8				N.T.	N.T.	1410	4950	2100	3500	32.2	.170	.345	.031	6.430
		9				N.T.	N.T.	1410	4910	2100	3500	32.2	.170	.365	.028	6.910

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	SUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
09/28	20-0	10	10 00	RAPID	FULL	N.T.	N.T.	1410	4950	2100	3500	32.2	.170	.370	.030	9.250
		11				N.T.	N.T.	1410	4950	2100	3500	32.2	.170	.375	.030	5.090
		12				N.T.	N.T.	1410	4980	2100	3500	32.2	.170	.380	.035	6.910
		13	20 00	SLOW		N.T.	N.T.	1520	5020	2100	3720	31.8	.175	.340	.035	-
		14		RAPID		N.T.	N.T.	1520	4990	2210	3720	32.2	.170	.330	.030	-
		15				N.T.	N.T.	1459	4950	2210	3720	32.2	.170	.340	.030	4.580
		16				N.T.	N.T.	1450	4950	2210	3720	32.2	.170	.340	.029	-
		17				N.T.	N.T.	1450	4950	2210	3720	32.2	.175	.340	.032	4.600
		18				N.T.	N.T.	1450	4950	2210	3720	32.2	.175	.330	.030	-
		19				N.T.	N.T.	1410	4950	2210	3720	32.2	.180	.335	.030	4.590
		20				N.T.	N.T.	1410	4950	2210	3720	32.2	.180	.330	.033	4.940
10/04	20-0	1	09 30	SLOW	FULL	N.T.	2790	1568	5140	2260	3720	(1)	(1)	(1)	.028	-
		2				N.T.	2780	1640	5180	2260	3730	30.5	.175	.330	.030	-
		3				N.T.	2776	1640	5170	2260	3730	30.2	.170	.305	.030	-
		4				N.T.	2799	1640	5425	2260	3730	30.2	.169	.325	.031	-
		5				N.T.	2743	1640	5200	2260	3710	30.2	.170	.320	.030	-
10/06	20-0	1	08 30	SLOW	NR.RED.	N.T.	2316	1510	3530	2160	3320	26.2	.165	.335	.032	-
		2			FULL	N.T.	2751	1640	5170	2160	3640	30.9	.170	.315	.030	-
		3				N.T.	2724	1513	5350	2160	3610	30.9	.170	.335	.030	-
		4				N.T.	2731	1640	5170	2200	3650	31.8	.170	.325	.032	-
		5				N.T.	2793	1640	5300	2200	3690	31.5	.165	.325	.035	-
		6				N.T.	2726	1640	5100	2220	3690	31.8	.170	.325	.029	-
		7			PROOF	23.9	2927	1649	5430	2209	3690	31.8	.165	.325	.028	-
10/07	20-0	1	08 30	SLOW	FULL	N.T.	2699	1590	5120	2170	3630	30.9	.180	.325	.026	-
		2				N.T.	2730	1510	5050	2169	3630	30.9	.165	.350	.030	-
		3				N.T.	2707	1640	5050	2160	3630	30.	.170	.340	.030	-
		4				N.T.	2737	1640	5250	2160	3640	30.9	.175	.310	.033	-
		5				N.T.	2711	1640	5300	2160	3640	30.9	.175	.330	.029	-
10/08	20-0	1	08 30	SLOW	FULL	N.T.	N.T.	1540	5260	2090	3590	31.8	.170	.350	.028	-
		2			PROOF	24.1	N.T.	1620	5390	2090	3570	31.8	.170	.355	.028	-
10/12	20-0	3	-	-	-	-	-	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	
10/13	20-1	1	10 00	SLOW	PRF.SER.	15.2	2375	1590	3530	2180	3340	23.8	.170	.360	.030	-
		2				15.9	2449	1548	3910	2250	3560	25.5	.175	.350	.031	-
		3				18.5	2538	1649	4440	2240	3619	25.6	.170	.345	.030	-
		4				21.6	2736	1568	4920	2280	3730	28.6	.170	.345	.023	-
		5				23.2	2803	1560	5770	2280	3770	29.3	.165	.340	.023	-
10/14	20-1	1	10 00	SLOW	NR.FULL	15.9	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
10/22	20-1	1	10 00	SLOW	NR.RED.	N.T.	2240	1570	3250	2280	3460	25.7	.170	.345	.036	-
		2				N.T.	2279	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-
		3				N.T.	2299	1579	3130	2280	3460	25.7	.170	.330	.035	-
		4				N.T.	2270	1579	3130	2280	3460	25.7	.170	.330	.031	-
		5				N.T.	2230	1579	3190	2280	3460	25.7	.175	.300	.033	-
		6				N.T.	2236	1570	3190	2280	3460	25.7	.170	.300	.031	-
11/02	20-1	1	03 09	SLOW	FULL	N.T.	2721	1590	4870	2290	3710	28.6	.170	.330	.028	-
		2				N.T.	2750	1649	5100	2290	3760	28.4	.165	.330	.031	-

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/02	29-1	3	03 39	SLOW	FULL	N.T.	2729	1640	4900	2290	3750	28.4	.165	.300	.028	-
		4	10 00	RAPID		N.T.	2716	1563	4900	2220	3640	28.4	.170	.305	.030	-
		5				N.T.	2704	1470	4910	2200	3640	28.4	.170	.305	.028	4.760
		6				N.T.	2717	1470	4810	2190	3640	28.4	.175	.310	.028	5.110
		7				N.T.	2689	1470	4670	2160	3640	28.7	.170	.315	.028	5.140
		8				N.T.	2703	1470	4760	2160	3640	28.7	.170	.320	.026	5.100
		9				N.T.	2637	1470	4700	2160	3640	28.7	.175	.315	.028	4.995
		10				N.T.	2702	1470	4790	2160	3640	29.1	.165	.345	.030	4.990
		11				N.T.	2595	1440	4730	2160	3640	29.1	.170	.355	.025	4.955
		12				N.T.	2710	1440	4760	2160	3640	29.1	.175	.350	.025	4.970
		13				N.T.	2715	1440	4780	2160	3640	29.1	.170	.370	.026	4.985
		14				N.T.	2695	1440	4760	2160	3640	29.1	.175	.370	.025	4.945
		15				N.T.	2688	1440	4760	2160	3640	29.1	.170	.385	(1)	N.T.
11/04	28-1	1	00 30	SLOW	RED.PRB.	N.T.	2086	1590	2600	2160	3030	22.1	.175	.335	.039	-
		2				N.T.	2127	1645	2970	2170	3090	23.6	.165	.350	.028	-
		3				N.T.	2190	1645	3120	2170	3140	24.4	.190	.330	.025	-
		4				N.T.	2253	1645	3320	2170	3170	25.6	.170	.335	.025	-
		5				N.T.	2296	1645	3460	2200	3230	26.5	.170	.340	.025	-
		6				N.T.	2339	1645	3610	2200	3230	26.5	.170	.330	.022	-
		7	20 00	RAPID	FULL	N.T.	2717	1570	5100	2130	3640	31.8	.185	.390	.030	-
		8				N.T.	2692	1420	4990	2130	3680	32.1	.180	.380	.030	4.800
		9				N.T.	2715	1420	4990	2130	3640	32.4	.175	.380	.030	5.025
		10				N.T.	2714	1420	4990	2130	3640	32.7	.170	.385	.031	4.975
		11				N.T.	2712	1420	4990	2130	3680	32.7	.180	.390	.028	5.020
		12				N.T.	2739	1420	4990	2130	3640	32.7	.185	.380	.031	4.995
		13				N.T.	2706	1420	4930	2130	3650	32.7	.160	.390	.028	4.959
		14				N.T.	2708	1420	4930	2130	3690	32.7	.185	.390	.031	5.002
		15				N.T.	2700	1420	4930	2130	3680	32.7	.180	.400	.030	5.000
		16				N.T.	2714	1420	4930	2130	3690	32.7	.185	.400	.031	5.073
		17		SLOW		N.T.	2706	1420	4930	2130	3690	32.4	.175	.360	.029	-
		18				N.T.	2710	1420	4930	2130	3510	32.4	.170	.365	.030	-
11/05	24-1	1	33 30	RAPID	FULL	N.T.	N.T.	1470	5300	2130	3610	33.6	.170	.320	(1)	-
		2				N.T.	N.T.	1410	5060	2130	3610	31.5	.170	.340	(1)	4.863
		3				N.T.	N.T.	1410	4950	2130	3610	31.5	.175	.335	(1)	5.237
		4				N.T.	N.T.	1410	5000	2130	3610	31.5	.170	.340	(1)	5.125
		5				N.T.	N.T.	1410	4950	2130	3610	31.8	.180	.330	(1)	5.103
		6				N.T.	N.T.	1410	4950	2130	3610	31.8	.175	.345	(1)	5.182
		7				N.T.	N.T.	1410	4950	2130	3610	31.9	.175	.345	(1)	5.110
		8				N.T.	N.T.	1410	5060	2130	3610	32.1	.175	.350	(1)	5.190
		9				N.T.	N.T.	1410	4950	2130	3610	32.1	.175	.355	(1)	5.198
		10				N.T.	N.T.	1410	4950	2130	3610	32.1	.175	.365	(1)	5.109
		11				N.T.	N.T.	1410	4950	2130	3610	32.1	.175	.370	(1)	5.153
		12				N.T.	N.T.	1380	5060	2130	3610	32.4	.165	.380	(1)	5.060
11/09	28-1	1	10 00	RAPID	FULL	N.T.	2691	1650	5110	2200	3640	30.3	.180	.390	.029	-
		2				N.T.	2716	1620	5140	2200	3670	31.5	.190	.390	.030	4.800

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-700	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/09	20-1	3	10 00	RAPID	FULL	N.T.	2719	1629	5140	2200	3670	31.5	.180	.370	.031	5.105
		4				N.T.	2796	1620	5140	2200	3670	31.5	.170	.370	.030	5.180
		5				N.T.	2693	1620	5020	2200	3670	31.5	.175	.380	.030	4.980
		6				N.T.	2715	1623	5040	2179	3670	31.5	.180	.370	.029	4.975
		7				N.T.	2712	1533	5020	2160	3670	31.5	.168	.394	.031	5.066
		8				N.T.	2697	1560	4960	2160	3550	31.2	.182	.401	.031	4.986
		9				N.T.	2695	1539	4910	2160	3650	31.2	.166	.437	.032	5.092
		10				N.T.	2769	1569	4990	2160	3650	31.5	.188	.405	.031	5.030
		11				N.T.	2709	1530	4960	2160	3650	31.5	.172	.413	.030	4.975
		12				N.T.	2709	1530	5080	2160	3670	31.5	.179	.411	.030	5.069
		13				N.T.	2709	1533	5020	2160	3670	31.5	.178	.425	.031	5.156
		14				N.T.	2694	1470	4960	2160	3670	31.8	.151	.426	.034	5.082
		15				N.T.	2718	1590	4960	2170	3670	31.8	.177	.423	.034	5.083
		16				N.T.	2783	1479	4990	2160	3670	31.5	.161	.431	.033	5.158
		17				N.T.	2790	1500	5080	2160	3670	31.8	.157	.433	.035	5.076
		18				N.T.	2690	1530	4940	2160	3690	31.5	.161	.441	.028	5.072
		19				N.T.	2700	1530	5050	2160	3690	31.8	.153	.447	.032	5.159
		20				N.T.	2702	1730	5000	2290	3730	30.9	.180	.335	.027	-
11/12	20-1	1	10 00	SLOW RAPID	FULL	N.T.	2690	1598	5000	2110	3600	30.9	.165	.395	.032	-
		2				N.T.	2725	1450	4970	2110	3590	31.4	.165	.380	.034	4.855
		3				N.T.	2707	1480	4970	2110	3590	31.4	.170	.380	.033	5.085
		4				N.T.	2715	1430	4950	2090	3590	31.7	.163	.390	.034	5.156
		5				N.T.	2732	1450	5000	2090	3600	31.7	.160	.372	.032	5.157
		6				N.T.	2717	1510	4890	2080	3550	32.0	.180	.369	.032	5.078
		7				N.T.	2704	1489	4860	2090	3550	32.0	.172	.348	.031	5.045
		8				N.T.	2706	1480	4960	2090	3600	31.7	.169	.395	.032	4.939
		9				N.T.	2771	1480	4890	2090	3590	32.3	.170	.400	.030	5.066
		10				N.T.	2716	1400	4890	2090	3550	32.3	.171	.401	.037	5.150
		11				N.T.	2707	1480	4860	2090	3570	32.0	.172	.406	.035	5.039
		12				N.T.	2707	1483	4920	2090	3590	32.3	.173	.415	.030	5.047
		13				N.T.	2710	1450	4920	2090	3590	32.0	.173	.417	.030	5.138
		14				N.T.	2702	1400	4940	2080	3590	31.7	.178	.421	.029	5.037
		15				N.T.	2712	1480	4890	2093	3570	32.3	.169	.431	.033	5.065
		16				N.T.	2497	1490	4860	2090	3570	32.3	.164	.439	.031	5.124
		17				N.T.	2711	1480	4890	2090	3670	32.0	.176	.429	.033	4.967
		18				N.T.	2729	1489	4920	2098	3550	32.0	.173	.432	.034	5.052
		19				N.T.	2724	1430	4950	2090	3570	32.0	.178	.432	.035	5.046
		20				N.T.	2716	1400	4950	2093	3530	31.7	.177	.431	.036	5.120
		21				N.T.	2699	1430	4920	2090	3570	31.4	.177	.426	.033	5.041
		22				N.T.	2681	1480	4890	2110	3590	31.1	.172	.438	.030	4.977
		23				N.T.	2705	1400	4950	2090	3590	31.7	.175	.433	.032	5.144
		24				N.T.	2769	1510	4970	2110	3590	31.4	.174	.426	.033	5.035
		25				N.T.	2703	1450	4970	2119	3600	31.1	.173	.430	.033	5.046
		26				N.T.	2719	1510	5030	2110	3620	31.4	.173	.420	.032	5.125
		27				N.T.	2692	1540	4920	2150	3660	31.1	.170	.335	(1)	-

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-900	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/12	20-1	28	10 00	RAPID	FULL	N.T.	2707	1450	4920	2170	3640	31.1	.175	.345	(1)	4.714
		29				N.T.	2694	1440	4860	2150	3650	31.1	.170	.345	N.T.	5.073
		30				N.T.	2707	1400	4960	2140	3650	31.4	.170	.353	N.T.	5.066
		31				N.T.	2685	1480	4840	2120	3640	31.7	.177	.352	N.T.	5.148
		32				N.T.	2699	1430	4861	2120	3639	31.4	.163	.370	N.T.	5.030
		33				N.T.	2690	1400	4810	2110	3639	31.7	.178	.360	N.T.	5.042
		34				N.T.	2689	1450	4860	2110	3630	31.7	.177	.364	N.T.	5.128
		35				N.T.	2643	1400	4750	2110	3630	31.4	.167	.373	N.T.	5.035
		36				N.T.	2721	1450	4920	2110	3650	31.7	.170	.369	N.T.	5.037
		37				N.T.	2704	1400	4920	2110	3638	31.7	.172	.339	N.T.	5.128
		38				N.T.	2690	1400	4860	2110	3650	31.2	.173	.371	N.T.	5.038
		39				N.T.	2718	1400	4920	2110	3650	31.7	.174	.374	N.T.	5.026
		40				N.T.	2577	1439	4810	2110	3620	31.4	.172	.372	N.T.	5.151
		41				N.T.	2693	1370	4890	2110	3630	32.1	.175	.369	N.T.	5.030
		42				N.T.	2714	1340	4920	2110	3630	32.3	.171	.375	N.T.	5.030
		43				N.T.	2683	1340	4910	2110	3670	31.7	.167	.362	N.T.	5.115
		44				N.T.	2711	1340	4920	2110	3630	31.7	.172	.371	N.T.	5.038
		45				N.T.	2702	1340	4920	2110	3600	31.4	.176	.367	N.T.	5.030
		46				N.T.	2672	1340	4700	2110	3590	31.4	.173	.367	N.T.	5.090
		47				N.T.	2687	1340	4840	2110	3570	31.4	N.T.	N.T.	N.T.	4.922
		48				N.T.	2673	1540	4720	2220	3640	31.4	.172	.316	N.T.	-
		49				N.T.	2716	1450	4860	2170	3680	32.3	.170	.325	N.T.	5.125
		50				N.T.	2597	1430	4790	2140	3600	32.3	.170	.323	N.T.	5.077
		51				N.T.	2672	1400	4640	2120	3600	32.7	.160	.325	N.T.	5.036
		52				N.T.	2702	1450	4700	2120	3690	33.0	.169	.327	N.T.	5.065
		53				N.T.	2691	1400	4640	2120	3600	33.0	.168	.331	N.T.	5.027
		54				N.T.	2707	1450	4640	2120	3650	33.0	.172	.330	N.T.	5.015
		55				N.T.	2709	1430	4670	2110	3660	33.3	.170	.338	N.T.	5.005
		56				N.T.	2709	1400	4640	2120	3640	33.6	.173	.336	N.T.	5.025
		57				N.T.	2717	1400	4700	2110	3660	33.3	.179	.330	N.T.	5.040
		58				N.T.	2670	1490	4640	2113	3660	33.3	.175	.333	N.T.	5.087
		59				N.T.	2719	1400	4700	2110	3660	33.6	.172	.340	N.T.	4.953
		60				N.T.	2701	1400	4700	2129	3650	33.6	.170	.330	N.T.	4.930
		61				N.T.	2704	1370	4720	2129	3660	33.3	.168	.342	N.T.	5.060
		62				N.T.	2705	1400	4720	2120	3660	33.3	.167	.335	N.T.	5.023
		63				N.T.	2696	1400	4720	2120	3660	33.0	.162	.358	N.T.	4.920
		64				N.T.	2693	1400	4780	2110	3660	33.0	.171	.359	N.T.	5.072
		65				N.T.	2595	1370	4750	2120	3560	33.0	.164	.356	N.T.	5.010
		66				N.T.	2665	1379	4670	2120	3660	32.3	.171	.349	N.T.	5.018
		67				N.T.	2691	1400	4810	2120	3660	33.0	.165	.355	N.T.	5.067
		68				N.T.	2690	1400	4840	2120	3660	32.1	.168	.359	N.T.	5.020
		69				N.T.	2679	1430	4750	2129	3660	32.1	.182	.361	N.T.	5.017
		70				N.T.	2700	1400	4960	2129	3660	32.1	.175	.352	N.T.	5.175
		71				N.T.	2690	1400	4840	2120	3660	31.7	.174	.356	N.T.	5.017
		72				N.T.	2709	1310	4060	2120	3660	31.7	.172	.363	N.T.	4.995

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTER CYLINDER STATIC PRESS. (PSI)	COUNTER CYLINDER MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/12	20-1	73	10 00	RAPID	FULL	N.T.	2691	1370	4750	2120	3560	31.4	.160	.366	(1)	5.070
		74				N.T.	2697	1570	4940	2490	3700	31.4	.174	.379	(1)	-
		75				N.T.	2693	1480	4700	2990	3700	31.7	.170	.430	(1)	4.697
11/16	20-1	1	27 00	RAPID	FULL	N.T.	2646	1510	4790	2090	3510	31.9	.175	.304	.025	-
		2				N.T.	2697	1510	4900	2000	3540	32.5	.166	.350	.026	4.729
		3				N.T.	2699	1510	4820	2000	3590	32.5	.105	.342	.020	4.815
		4				N.T.	2725	1490	4920	2900	3540	33.1	.167	.350	.031	5.068
		5				N.T.	2677	1490	4770	1970	3510	33.4	.191	.357	.030	4.779
		6				N.T.	2711	1490	4840	1970	3510	33.4	.170	.333	.032	4.709
		7				N.T.	2690	1490	4790	1970	3510	33.1	.160	.354	.032	5.090
		8				N.T.	2783	1499	4020	1370	3540	33.1	.172	.354	.028	4.776
		9				N.T.	2697	1490	4790	1970	3510	33.1	.185	.370	.029	4.676
		10				N.T.	2592	1490	4790	1970	3540	33.1	.172	.376	.030	5.060
		11				N.T.	2681	1490	4770	1970	3540	33.1	.172	.385	.030	4.764
		12				N.T.	2669	1490	4770	1970	3510	33.1	.175	.367	.031	4.691
11/22	20-1	1	09 00	RAPID	FULL	N.T.	2652	1520	4990	2220	3670	33.4	.164	.337	.032	-
		2				N.T.	2674	1490	4860	2220	3670	31.0	.182	.334	.030	4.743
		3				N.T.	2665	1490	4830	2200	3690	31.3	.173	.337	.032	5.134
		4				N.T.	2664	1460	4630	2180	3690	30.7	.170	.320	.030	5.128
		5				N.T.	2697	1490	4830	2209	3710	31.3	.170	.346	.031	4.976
		6				N.T.	2687	1460	4830	2100	3710	31.3	.159	.347	.032	5.091
		7				N.T.	2676	1430	4770	2100	3710	31.0	.173	.331	.030	5.180
		8				N.T.	2694	1430	4770	2190	3710	31.0	.160	.362	.034	5.093
		9				N.T.	2689	1494	4809	2100	3710	31.3	.163	.367	.033	5.079
		10				N.T.	2677	1490	4770	2180	3693	31.3	.171	.368	.033	5.116
		11				N.T.	2479	1460	4600	2100	3710	31.3	.176	.365	.030	5.066
		12				N.T.	2666	1460	4770	2200	3710	31.3	.170	.368	.029	4.943
		13				N.T.	2655	1460	4770	2200	3710	31.3	.174	.369	.035	5.071
		14				N.T.	2673	1460	4770	2190	3710	31.3	.173	.379	.034	5.001
		15				N.T.	2690	1460	4900	[illegible]	3710	31.3	.172	.386	.036	5.040
		16				N.T.	2690	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		17				N.T.	2661	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		18				N.T.	2676	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		19				N.T.	2650	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		20				N.T.	2656	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		21				N.T.	2653	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		22				N.T.	2665	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		23				N.T.	2666	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		24				N.T.	2679	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		25				N.T.	2479	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		26				N.T.	2677	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		27				N.T.	2651	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		28				N.T.	2670	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		29				N.T.	2710	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		30				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/22	20-1	31	05 00	RAPID	FULL	N.T.	2692	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		32				N.T.	2692	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		33				N.T.	2670	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
11/23	20-1	1	27 00	RAPID	FULL	N.T.	2707	1500	5110	2100	3710	32.0	.169	.395	.034	-
		2				N.T.	2659	1440	5120	2100	3730	32.3	.174	.390	.029	4.737
		3				N.T.	2717	1440	5090	2150	3730	32.9	.177	.369	.031	4.900
		4				N.T.	2701	1440	4990	2159	3739	32.9	.179	.370	.036	5.097
		5				N.T.	2604	1440	4900	2150	3730	32.9	.173	.384	.032	4.843
		6				N.T.	2646	1441	4980	2130	3710	33.2	.177	.381	.031	4.826
		7				N.T.	2646	1410	4870	2130	3710	33.6	.179	.386	.030	5.031
		8				N.T.	2703	1380	4900	2130	3710	33.6	.170	.393	.040	4.020
		9				N.T.	2695	1410	4900	2130	3710	33.6	.175	.400	.030	4.020
		10				N.T.	2729	1440	5020	2130	3710	33.6	.177	.408	.035	5.000
		11				N.T.	2470	1440	4910	2150	3710	33.6	.176	.410	.031	4.039
		12				N.T.	2691	1410	4930	2130	3710	33.6	.174	.415	.031	4.023
		13				N.T.	2705	1410	4960	2150	3710	33.6	.180	.418	.034	5.036
		14				N.T.	2699	1410	4930	2170	3710	33.6	.170	.419	.030	4.051
		15				N.T.	2679	1410	4900	2170	3710	33.6	.162	.420	.030	4.070
		16	OSC.			N.T.	N.T.	[illegible]	4930	2190	3670	30.0	.160	.329	.020	-
		17				N.T.	N.T.	1450	4830	2100	3670	31.7	.173	.341	.031	5.610
		18				N.T.	N.T.	1420	4740	2100	3670	31.7	.173	.327	.035	5.616
		19				N.T.	N.T.	1400	4860	2109	3670	31.7	.180	.331	.033	24.152
		20				N.T.	N.T.	1390	4770	2100	3670	31.7	.172	.334	.032	6.500
11/30	20-1	1	00 00	RAPID	FULL	N.T.	[illegible]	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	2723	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.760
		3				N.T.	2469	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		4				N.T.	2685	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.150
		5				N.T.	2673	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.090
		6				N.T.	2693	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		7				N.T.	2701	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	6.000
		8				N.T.	2699	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		9				N.T.	2707	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		10				N.T.	2683	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	6.100
		11				N.T.	2714	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		12				N.T.	2696	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		13				N.T.	2712	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	6.130
		14				N.T.	2665	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		15				N.T.	2605	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.090
		16	OSC.			N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		17				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.750
		18				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.030
		19				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	34.410
		20				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.010
		21				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		22				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	31.690

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (TST) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CYLINDER STATIC PRESS. (PSI)	COUNTR CYLINDER MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURATION (SEC)	COUNTR RECOIL DURATION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
11/30	20-1	23	OSC.	RAPID	FULL	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.070
		24				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.730
		25				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	24.620
		26				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.020
		27				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		28				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	37.620
		29				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.020
		30				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.090
12/01	20-1	1	27 00	RAPID	FULL	N.T.	2694	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	2598	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.710
		3				N.T.	2688	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.850
		4				N.T.	2695	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.140
		5				N.T.	2640	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.880
		6				N.T.	2705	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.840
		7				N.T.	2694	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		8				N.T.	2697	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.860
		9				N.T.	2708	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.850
		10				N.T.	2691	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		11				N.T.	2592	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.940
		12				N.T.	2643	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.840
		13				N.T.	2677	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.020
		14				N.T.	2692	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.880
		15				N.T.	2678	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.850
		16		SLOW		N.T.	2720	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		17				N.T.	2578	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		18		RAPID		N.T.	2729	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		19				N.T.	2691	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.720
		20				N.T.	2694	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.840
		21				N.T.	2693	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		22				N.T.	2679	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.760
		23				N.T.	2701	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.850
		24				N.T.	2681	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.100
		25				N.T.	2651	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.800
		26				N.T.	2687	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.820
		27				N.T.	2653	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		28				N.T.	2591	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.870
		29		SLOW	RED.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
12/03	20-1	1	27 00	RAPID	FULL	N.T.	2564	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	(2)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.220
		3				N.T.	2656	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.280
		4				N.T.	2568	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.780
		5				N.T.	2702	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.470
		6				N.T.	2697	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.130
		7				N.T.	2675	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.020
		8				N.T.	2596	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.120

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL (A-NO)	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBR PRESS. (TST) (CU)	MUZ. VEL. (F/S)	RECOIL CYLINDR STATIC PRESS. (PSI)	RECOIL CYLINDR MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURATION (SEC)	COUNTR RECOIL DURATION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
12/83	20-1	9	2° 33	RAPID	FULL	N.T.	2692	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.750
		10				N.T.	2789	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.640
		11				N.T.	2692	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	20.120
		12				N.T.	2666	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	13.320
		13				N.T.	2652	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.650
		14				N.T.	2676	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	21.750
		15				N.T.	2676	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	12.790
		16		SLOW	RED.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		17	45 30	RAPID		N.T.	2139	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		18				N.T.	2151	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.800
		19				N.T.	2176	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.790
		20				N.T.	2151	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		21				N.T.	2161	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		22				N.T.	2190	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.770
		23				N.T.	2155	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		24				N.T.	2164	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		25				N.T.	2166	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.760
		26				N.T.	2159	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		27				N.T.	2165	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.770
		28				N.T.	2175	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.770
		29				N.T.	2155	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		30				N.T.	2137	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		31				N.T.	2170	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.770
		32				N.T.	2160	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		33				N.T.	2149	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		34				N.T.	2131	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.720
		35				N.T.	2163	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.850
		36				N.T.	2166	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		37				N.T.	2150	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.790
		38				N.T.	2156	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		39				N.T.	2175	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		40				N.T.	2155	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.800
		41				N.T.	2159	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.830
		42				N.T.	2179	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.790
		43				N.T.	2142	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		44				N.T.	2170	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.820
		45				N.T.	2167	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		46				N.T.	2163	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.820
12/13	20-1	1	29 00	SLOW	FULL	N.T.	2667	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2		RAPID		N.T.	2791	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				N.T.	2699	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	[illegible]
		4				N.T.	2596	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.070
		5				N.T.	2647	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		6				N.T.	2697	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		7				N.T.	2670	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.260

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL (X-MOD)	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (TSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURATION (SEC)	COUNTR RECOIL DURATION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
12/13	20-1	8	23 00	RAPID	FULL	N.T.	2791	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.933
		9				N.T.	2671	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.820
		10				N.T.	2638	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.160
		11				N.T.	2696	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		12				N.T.	2736	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.840
		13				N.T.	2693	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.350
		14				N.T.	2699	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		15				N.T.	2711	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.930
		16				N.T.	2789	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		17				N.T.	2669	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.890
		18				N.T.	2647	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		19				N.T.	2729	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		20				N.T.	2799	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		21				N.T.	2697	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		22				N.T.	2667	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.160
		23				N.T.	2677	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		24				N.T.	2688	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		25				N.T.	2682	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		26				N.T.	2701	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		27				N.T.	2695	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		28				N.T.	2649	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.160
		29				N.T.	2687	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.910
		30				N.T.	2682	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.930
		31				N.T.	2698	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.120
		32				N.T.	2693	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		33				N.T.	2698	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		34				N.T.	2657	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.140
		35				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.990
		36				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		37				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		38				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.900
		39	19 30			N.T.	2706	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		40				N.T.	2699	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	21.100
		41				N.T.	2691	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.620
		42				N.T.	2679	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	17.250
		43				N.T.	2695	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	20.650
		44				N.T.	2681	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.330
		45				N.T.	2582	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.400
		46				N.T.	2575	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	24.400
		47				N.T.	2600	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	18.360
		48				N.T.	2667	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	17.910
		49				N.T.	2596	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	17.220
		50				N.T.	2674	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.520
		51				N.T.	2664	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.680
		52				N.T.	2672	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.960

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-MOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
12/13	20-1	53	19 10	SLOW	FULL	N.T.	2647	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		54		RAPID		N.T.	2639	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		55				N.T.	2697	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	17.250
		56				N.T.	2675	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.600
		57				N.T.	2656	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	18.140
		58				N.T.	2691	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	20.750
		59				N.T.	2644	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.410
		60				N.T.	2572	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	17.130
		61				N.T.	2646	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	20.300
		62				N.T.	2648	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.250
		63				N.T.	2656	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.090
		64				N.T.	2677	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	20.170
		65				N.T.	2665	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.140
		66				N.T.	2652	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.470
		67				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.460
		68				N.T.	2591	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.380
		69				N.T.	2478	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.270
		70				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	19.838
		71				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	16.365
		72				N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	15.040
		73				N.T.	2666	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	18.258
		74		SLOW		N.T.	(1)	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		75				N.T.	2606	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
12/15	20-1	1	12 03	RAPID	FULL	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		2				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		3				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		4				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		5				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		6				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		7				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		8				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		9				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		10				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		11				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		12				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		13				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		14				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
		15				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
12/16	20-1	1	OSC.	RAPID	FULL	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.740
		3				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.130
		4				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	33.860
		5				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.930
		6				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.950
		7				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	47.130

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL EX-NOD	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CY. INDR STATIC PRESS. (PSI)	COUNTR CY. INDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
12/16	20-1	8	OSC.	RAPID	FULL	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.000
		9				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.040
		10				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	24.980
		11				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.980
		12				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.870
		13				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	14.930
		14				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.000
		15				N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.350
		16	35 00		RED.	N.T.	2166	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		17				N.T.	2173	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.880
		18				N.T.	2140	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.740
		19				N.T.	2188	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.960
		20				N.T.	2159	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		21				N.T.	2157	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.720
		22				N.T.	2158	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	9.360
		23				N.T.	2164	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.810
		24				N.T.	2160	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		25				N.T.	2171	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.990
		26				N.T.	2174	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T	4.710
		27				N.T.	2165	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.690
		28				N.T.	2170	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	11.500
		29				N.T.	2165	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.730
		30		SLOW		N.T.	2163	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		31		RAPID		N.T.	2171	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		32				N.T.	2156	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.960
		33				N.T.	2150	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		34				N.T.	2180	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.920
		35				N.T.	2181	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.710
		36				N.T.	2160	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.710
		37				N.T.	2159	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	11.380
		38				N.T.	2171	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.880
		39				N.T.	2169	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.780
		40				N.T.	2154	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.950
		41				N.T.	2141	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.660
		42				N.T.	2166	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.710
		43				N.T.	2169	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		44				N.T.	2159	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		45				N.T.	2165	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
12/22	20-1	1	64 00	SLOW	RED.	N.T.	2128	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		2		RAPID		N.T.	2160	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-
		3				N.T.	2143	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.004
		4				N.T.	2139	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.033
		5				N.T.	2146	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.030
		6				N.T.	2148	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.022
		7				N.T.	2161	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.016

TABLE G-3 (Continued)

DATE FIRED 1971	BARREL SE-NO	ROUND NO.	GUN ELEVATION (DEG-MIN)	MODE FIRED	CHARGE TYPE	CHAMBER PRESS. (PSI) (CU)	TRUN. VEL. (F/S)	RECOIL CYLINDER STATIC PRESS. (PSI)	RECOIL CYLINDER MAX. PRESS. (PSI)	COUNTR CYLINDR STATIC PRESS. (PSI)	COUNTR CYLINDR MAX. PRESS. (PSI)	MAX. RECOIL DISPL. (IN.)	RECOIL DURA-TION (SEC)	COUNTR RECOIL DURA-TION (SEC)	EJECT. TIME (SEC)	INTERVAL BETWEEN ROUNDS (SEC)
12/22	20-1	8	51 00	BURST	RED.	N.T.	2154	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	5.000
		9				N.T.	2163	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.981
		10				N.T.	2146	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.996
		11				N.T.	2136	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.994
		12				N.T.	2116	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.973
		13				N.T.	2126	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.989
		14				N.T.	2140	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.984
		15				N.T.	2111	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	4.982
12/23	20-1	1	16 00	SLOW	RED.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	-

NOTES: (1) INSTRUMENTATION FAILURE.

APPENDIX H

Power Measurement Data
Table H-1
Figures 1 Through 12

TABLE H-1

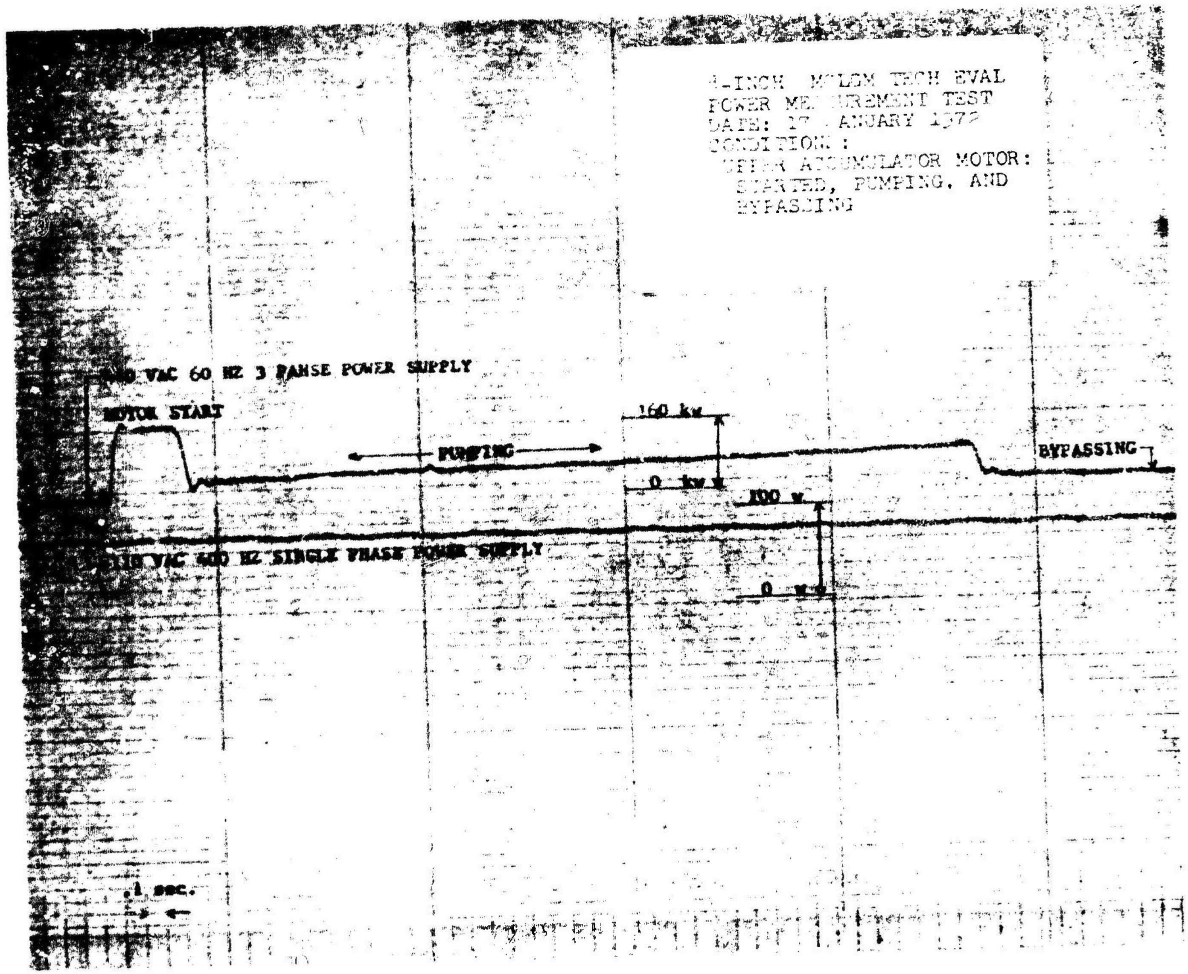
8"/55 MCLGM TECHNICAL EVALUATION TABULATION OF POWER MEASUREMENTS

440 VAC 60 Hz 3-PHASE POWER SUPPLY

MAJOR COMPONENTS	Figure Number	Measurement (KW)
Upper Accumulator		
Start	1	166
Maximum Pumping	1, 2	83
By-Passing	1, 2	10
Lower Accumulator		
Start	3	127
Maximum Pumping	3, 4	64
By-Passing	3, 4	3
Train Power Drive		
Start	5	287
Standby	5, 6	22
Synchronizing	6	367
Synchronized to SHM, 30° ampl. - 9 sec period	6	6 to 92
Elevation Power Drive		
Start	7	220
Standby	7, 8	12
Synchronizing	8	89
Synchronized to SHM, 30° ampl. - 9 sec period	8	0 to 57
Blower on	9	19
Anti-Icing System On	10	38
MOUNT OPERATIONS		
All Motors Start (Maximum)	11	414
Loading System Operating in Simulate, laying system synchronizing at maximum velocity, blower on, anti-icing system off (peak power condition except the anti-icing system is off)	12	599

110 VAC 400 Hz SINGLE PHASE POWER SUPPLY

Peak Reading	12	.75



DATE: 17 JANUARY 1972
CONDITION :
STARTED, PUMPING, AND
MOTOR START
PUMPING
160 kw
0 kw
100 w
0 w
BYPASSING
SINGLE PHASE POWER SUPPLY
1 sec.

FIGURE 1

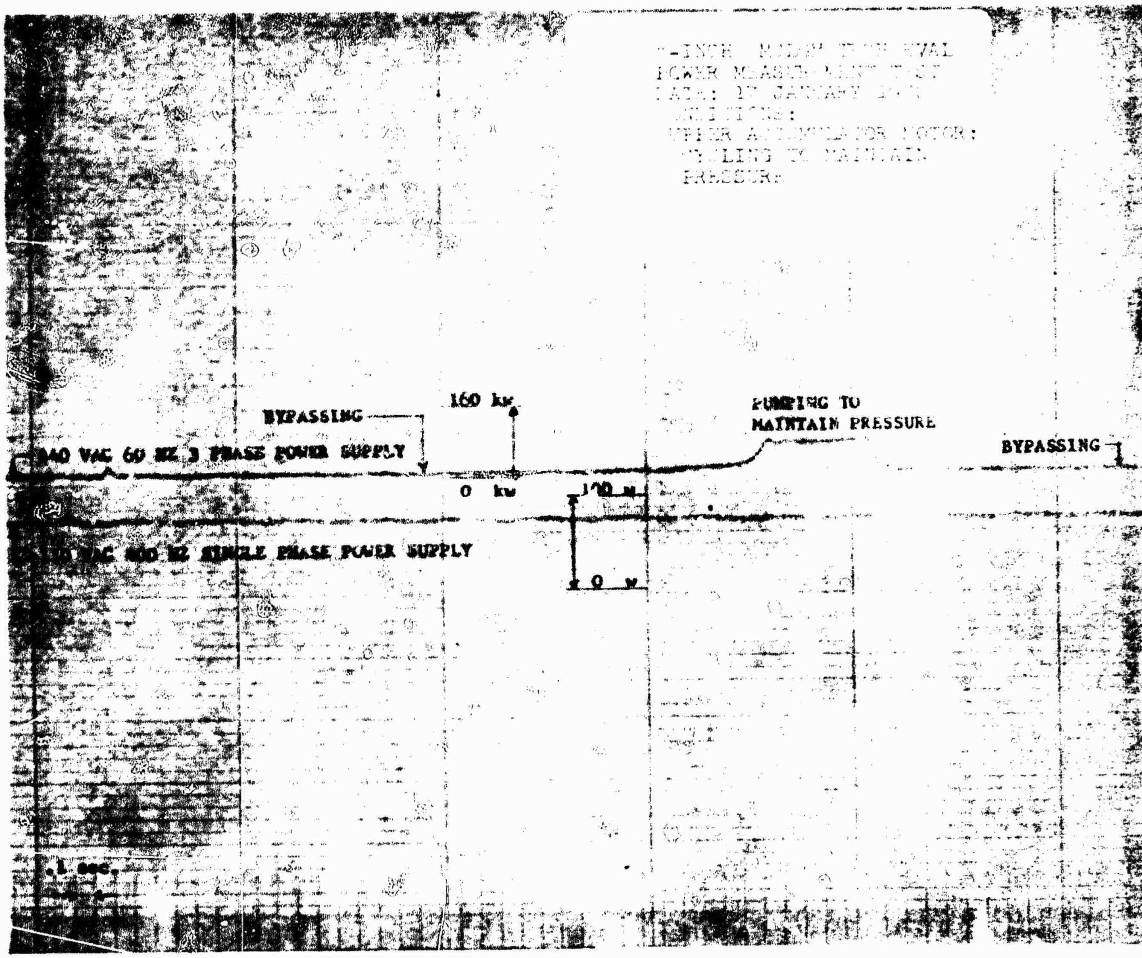
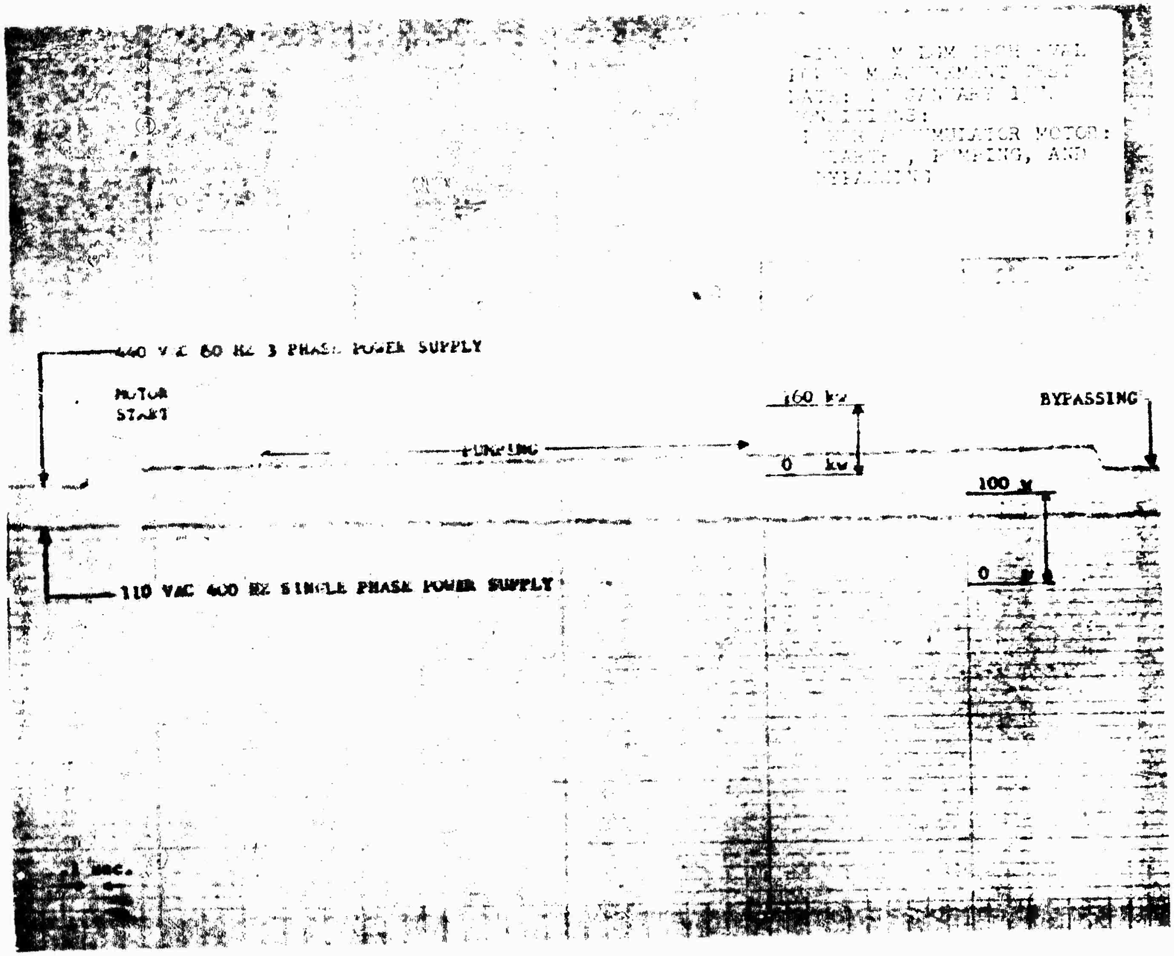

BYPASSING
160 kw
0 kw
PUMPING TO
MAINTAIN PRESSURE
BYPASSING
HZ 3 PHASE POWER SUPPLY
100 w
0 w
SINGLE PHASE POWER SUPPLY

FIGURE 2



460 VAC 60 HZ 3 PHASE POWER SUPPLY
MOTOR START
PUMPING
160 kw
0 kw
BYPASSING
100 v
0 v
110 VAC 400 HZ SINGLE PHASE POWER SUPPLY

FIGURE 3

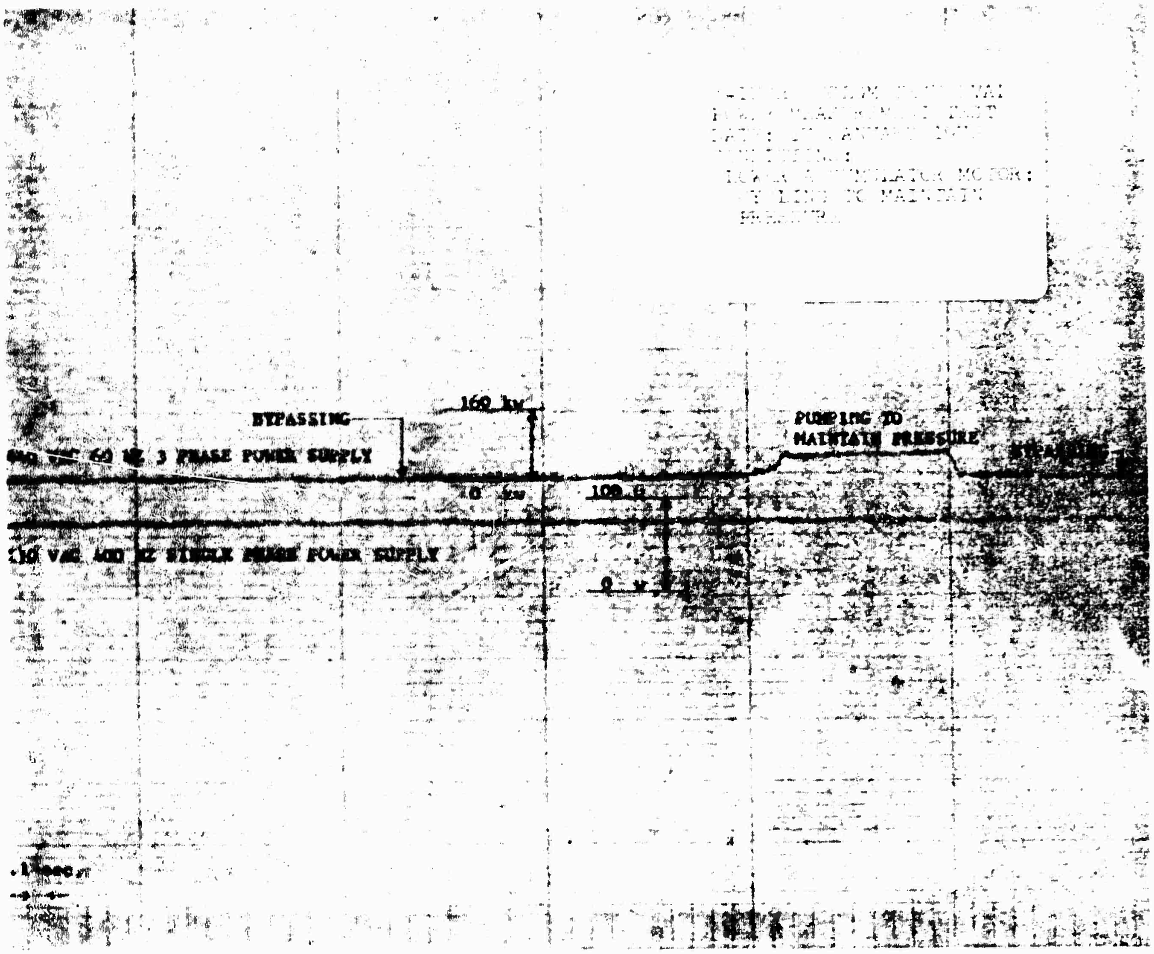

BYPASSING
160 kw
3 PHASE POWER SUPPLY
10 kw
PUMPING TO
MAINTAIN PRESSURE
0 v

FIGURE 4

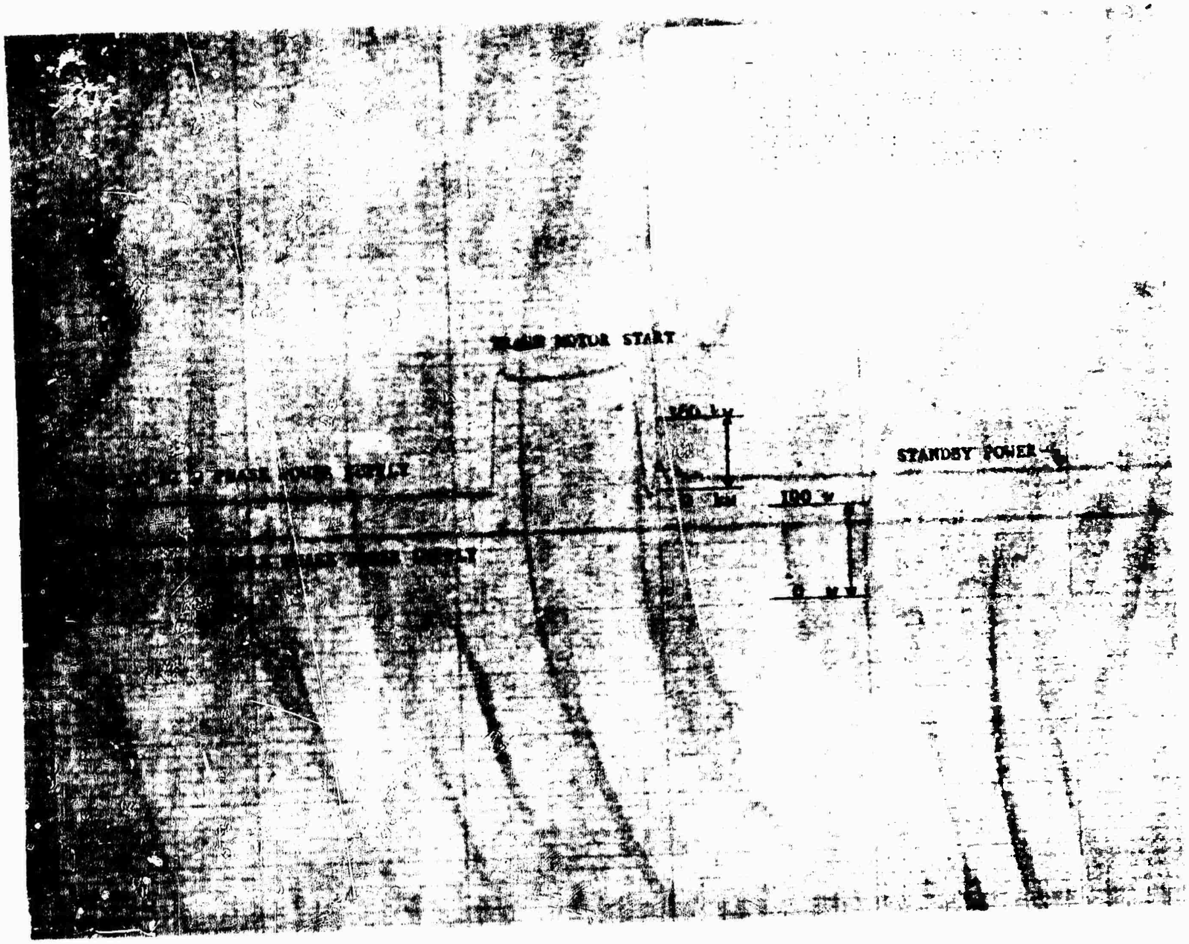


FIGURE 5

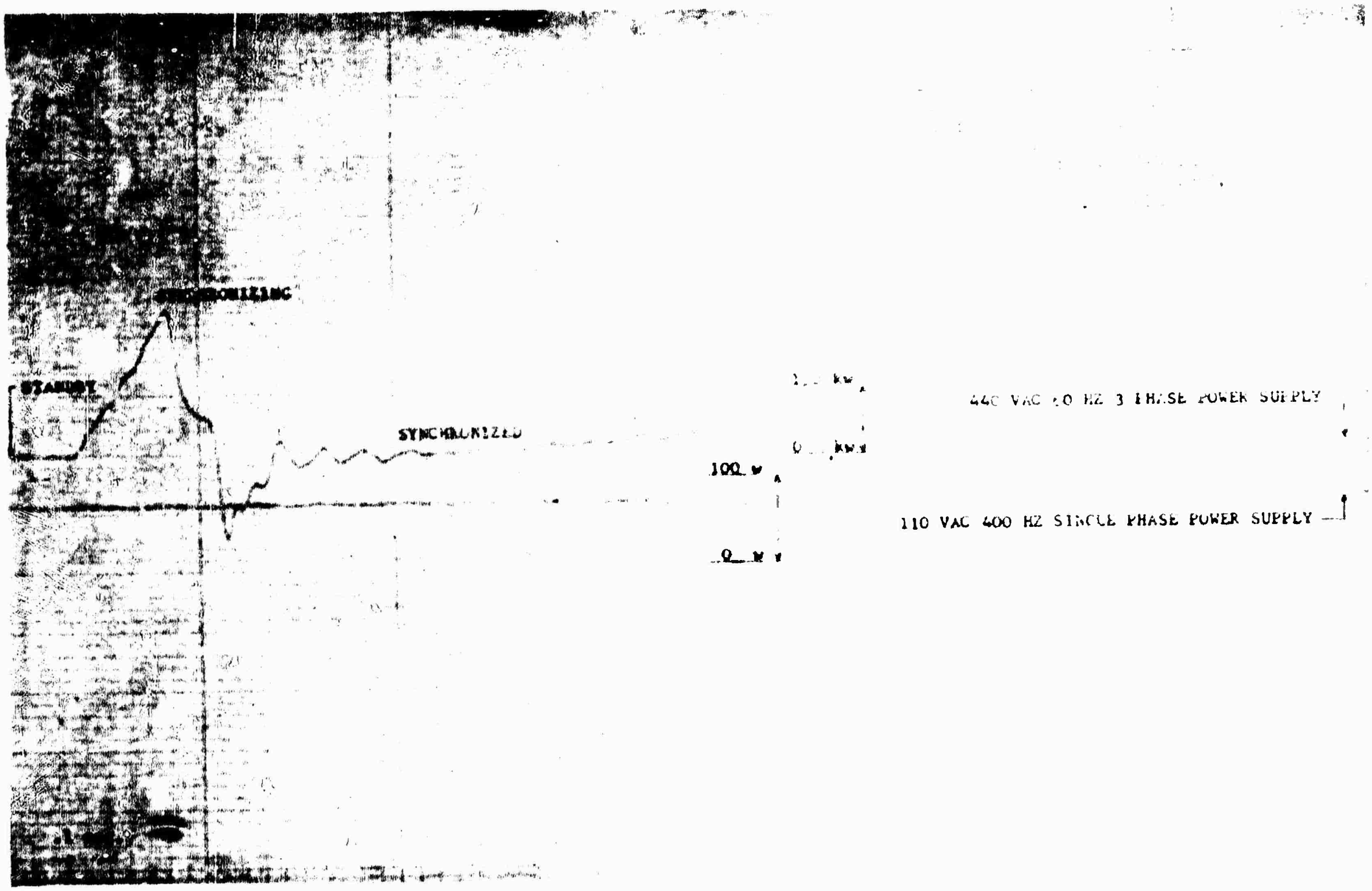

STANDBY
SYNCHRONIZING
SYNCHRONIZED
100 w
0 w
0 kw
440 VAC 60 HZ 3 PHASE POWER SUPPLY
110 VAC 400 HZ SINGLE PHASE POWER SUPPLY

FIGURE 6

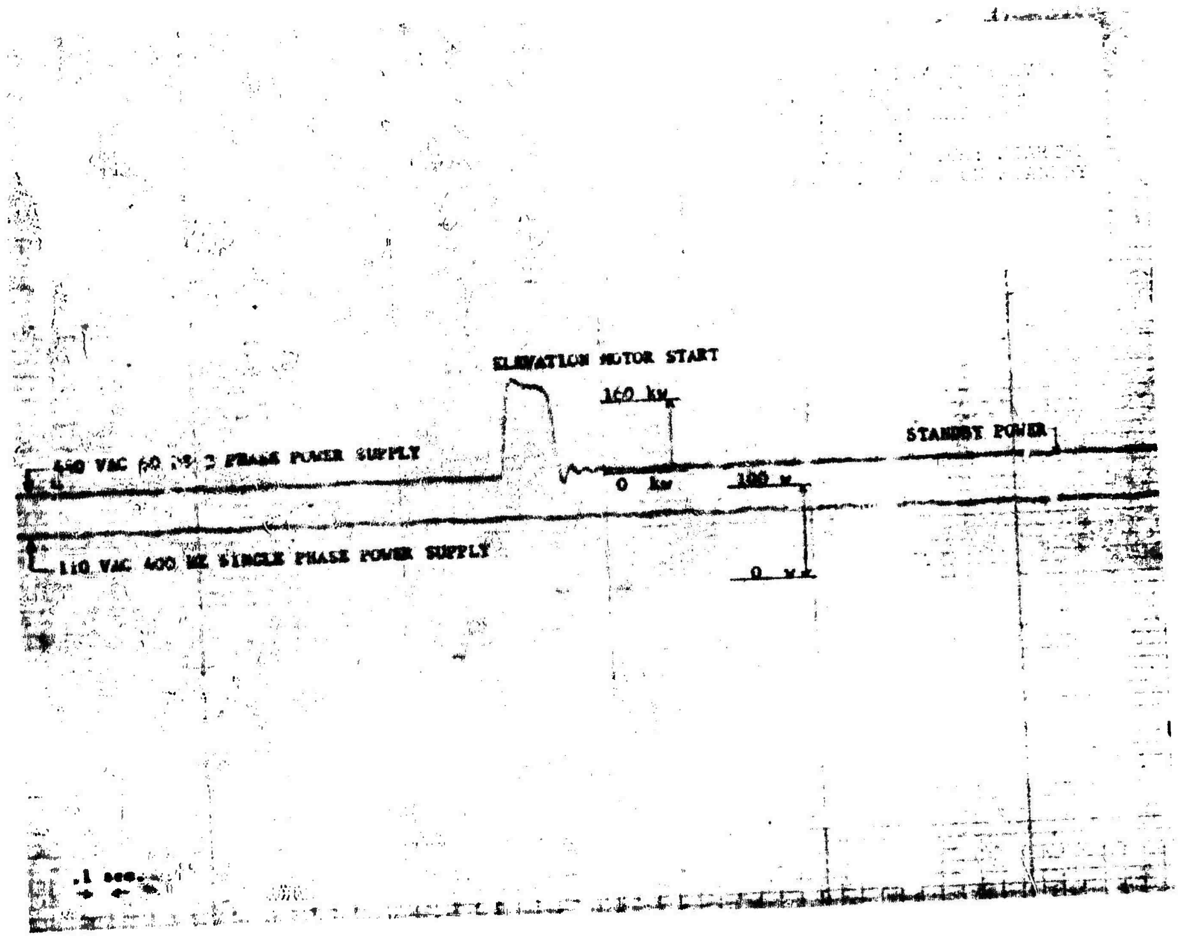

PHASE POWER SUPPLY
ELEVATION MOTOR START
160 kw
0 kw
STANDBY POWER
100 w
0 w
110 VAC 400
SINGLE PHASE POWER SUPPLY
.1 sec.

FIGURE 7

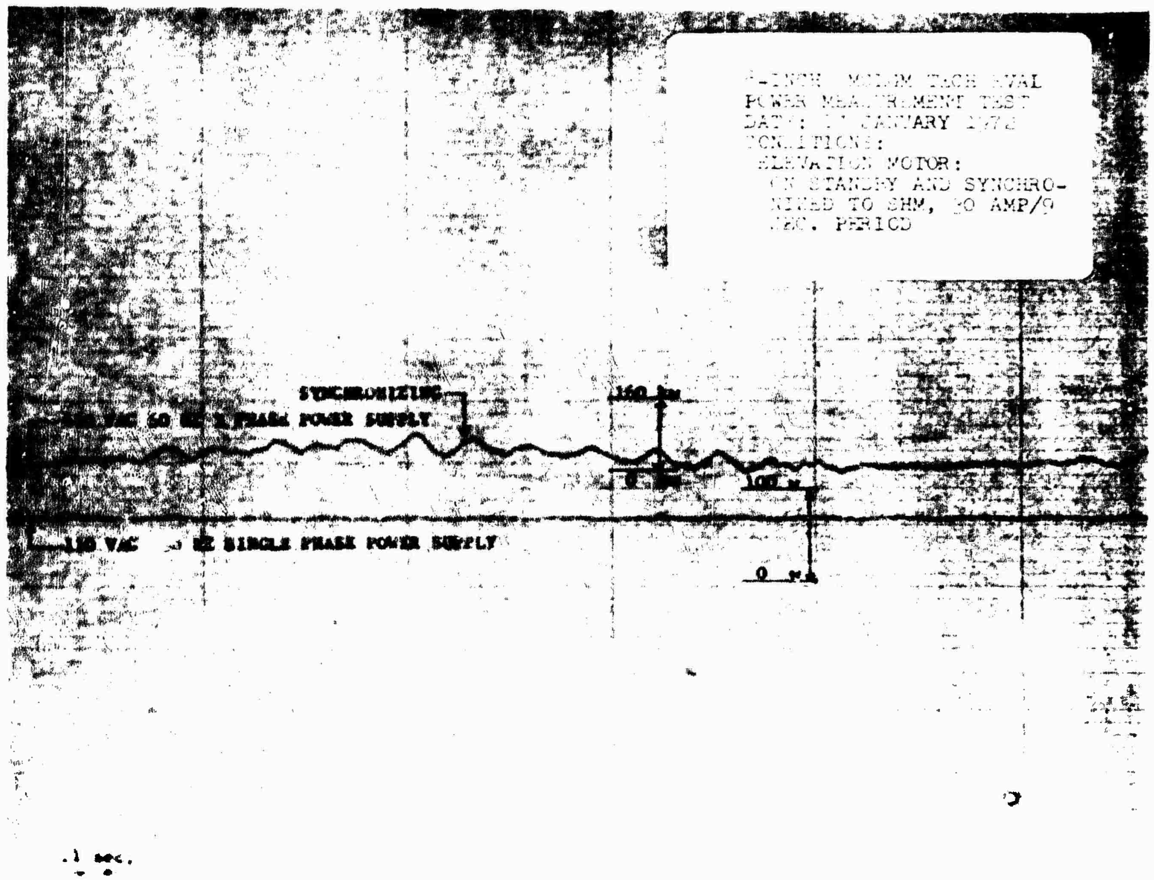

POWER MEASUREMENT TEST
ELEVATION MOTOR:
SYNCHRONIZING
160
0
.1 sec.

FIGURE 8

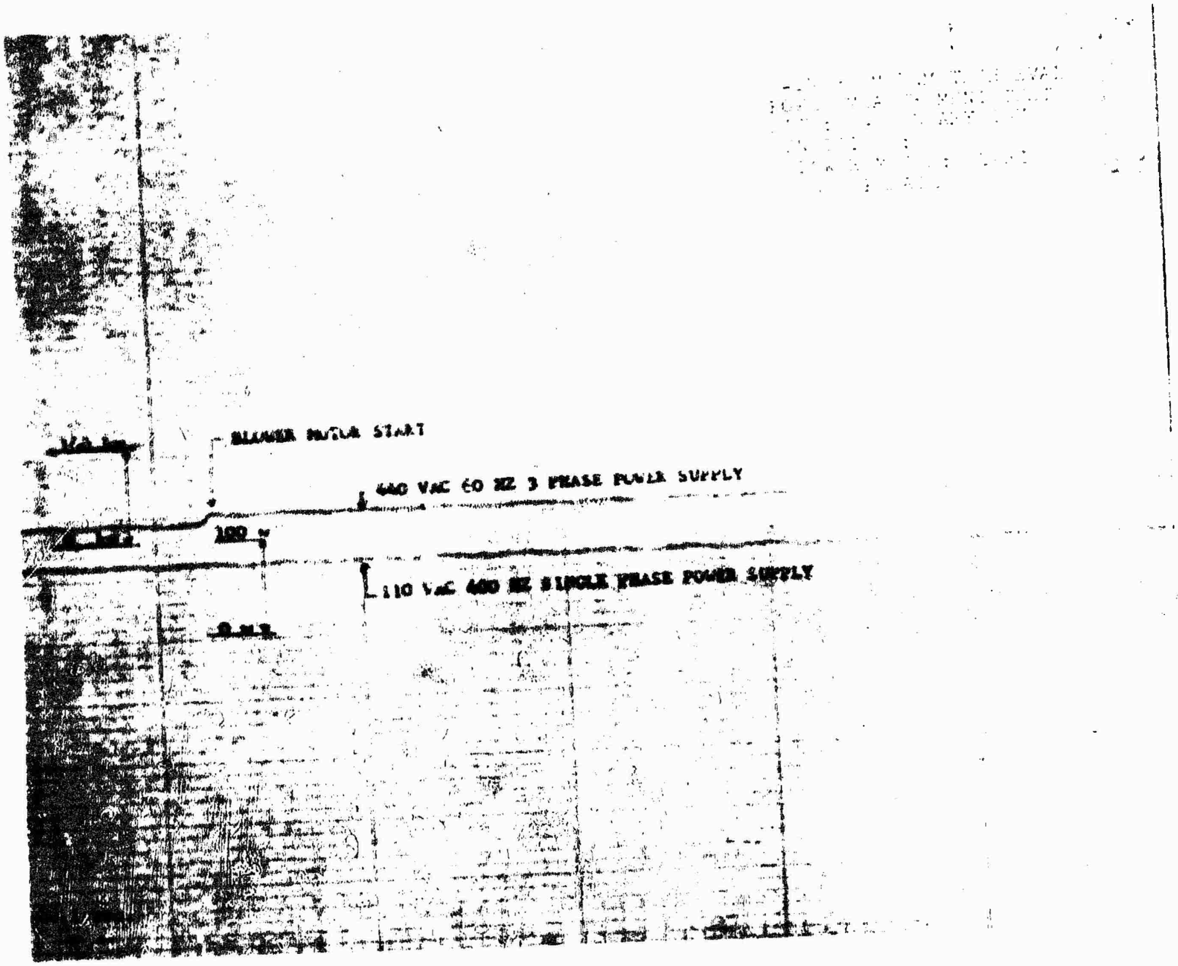

BLOWER MOTOR START
440 VAC 60 HZ 3 PHASE POWER SUPPLY
100
110 VAC 400 HZ SINGLE PHASE POWER SUPPLY

FIGURE 9

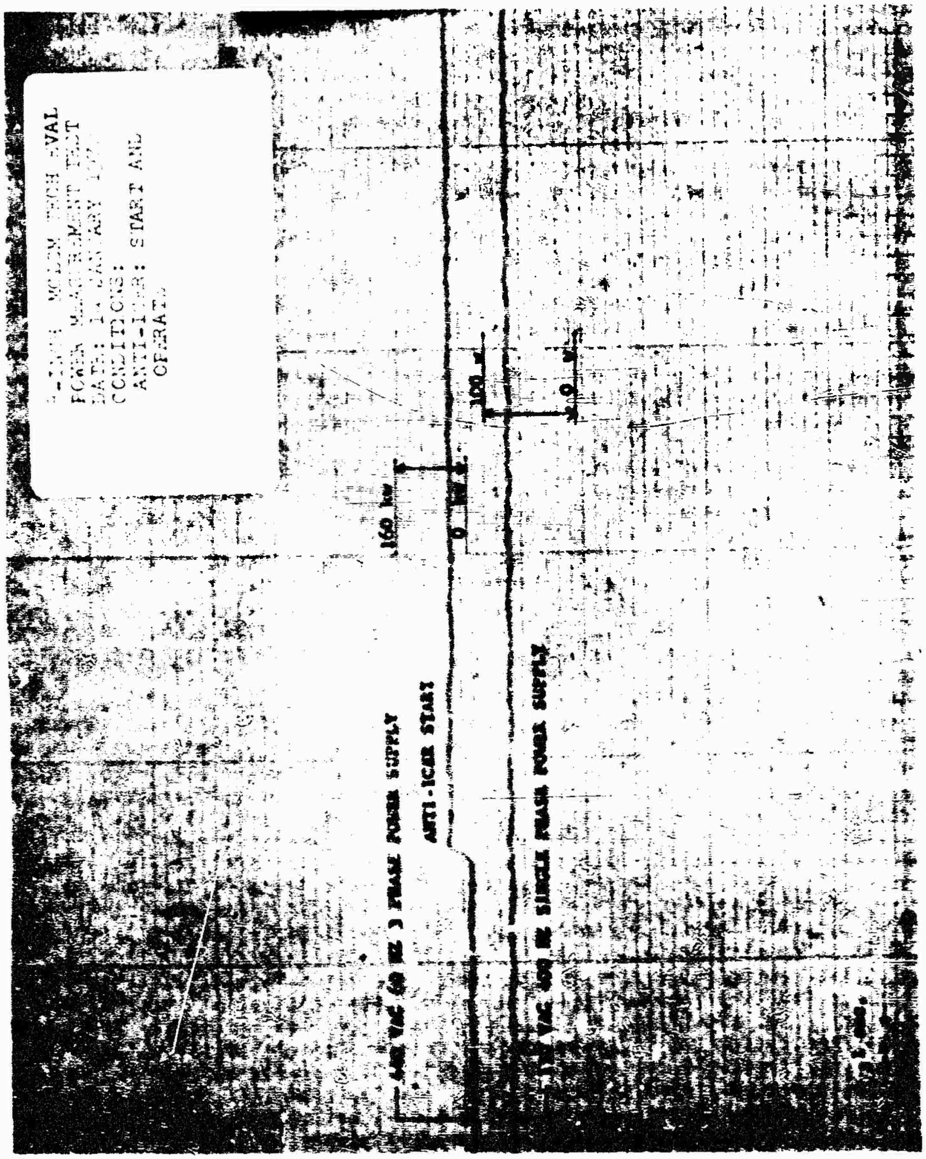

CONDITIONS:
START AND
OPERATE
160 kw
0 kw
100 w
0 w
ANTI-ICER START

FIGURE 10

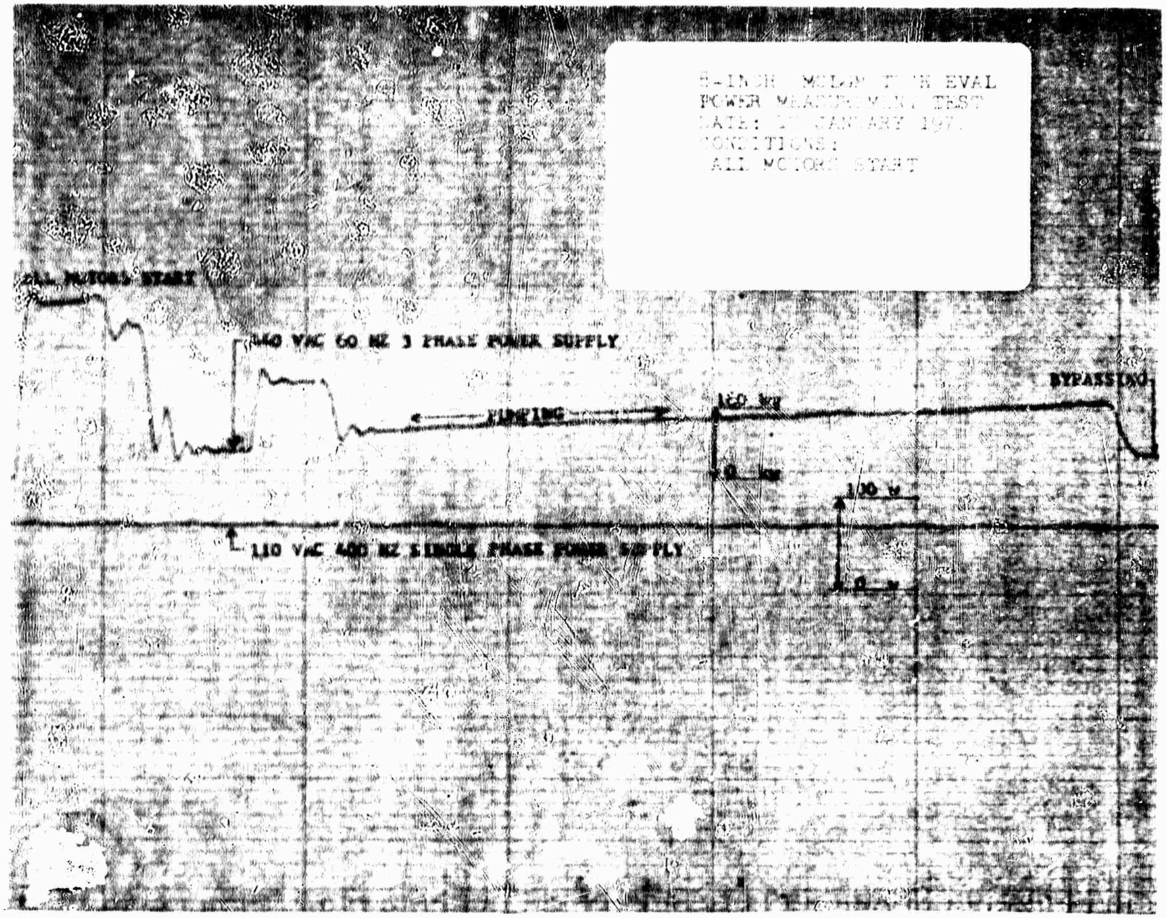

ALL MOTORS START
440 VAC 60 HZ 3 PHASE POWER SUPPLY
PUMPING
160 kw
0 kw
100 w
0 w
110 VAC 400 HZ SINGLE PHASE POWER SUPPLY
BYPASSING

FIGURE 11

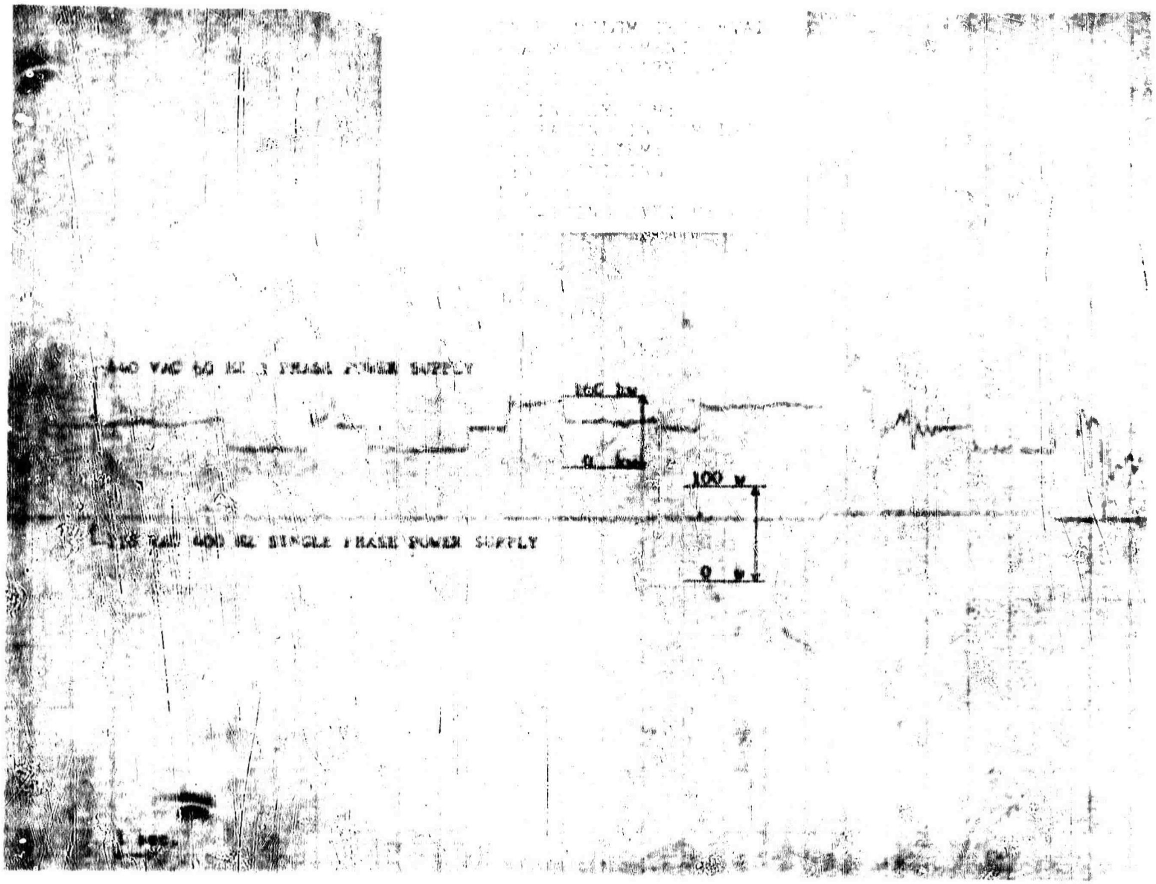

440 VAC 60 HZ 3 PHASE POWER SUPPLY
160 kw
0 kw
100 w
0 w
115 VAC 400 HZ SINGLE PHASE POWER SUPPLY

FIGURE 12

APPENDIX I

Gun Jump Data
Figure 1

8"/55 MCLGM TECHNICAL EVALUATION
DISCUSSION OF ATTEMPTS TO MEASURE GUN JUMP

General

It was decided not to include a gun jump test as a discrete Tech Eval test, but to attempt some experimentation prior to the planned rate of fire test of 2 November which might give an approximation of gun jump for one angle of elevation and give some basis for refinement of experimental techniques. Three different methods of determining gun jump were investigated.

Method I

Method I involved placing a camera at point A (Refer to Figure 1) at a distance R behind the gun and a distance H above the gun. The camera was aimed at an angle near α such that point D will be within the field of view. Point D is defined as the point along the trajectory where angle α equals angle θ. Then

$$\tan \alpha = \tan \theta \tag{1}$$

$$\tan \theta = \frac{\dot{z}}{\dot{x}} \tag{2}$$

$$\tan \alpha = \frac{z - H}{R + x} \tag{3}$$

$$\frac{\dot{z}}{\dot{x}} - \frac{z - H}{R + x} = 0 \tag{4}$$

Equation (4) can be satisfied for a time, t, by using particle trajectory data and interpolating. Using this value of t, z and x can be found from Equation (4) and α can then be obtained from Equation (3). The gun jump value can then be determined by measuring the displacement of the projectile above or below the center of the film (on the frame where the projectile has reached a maximum height).

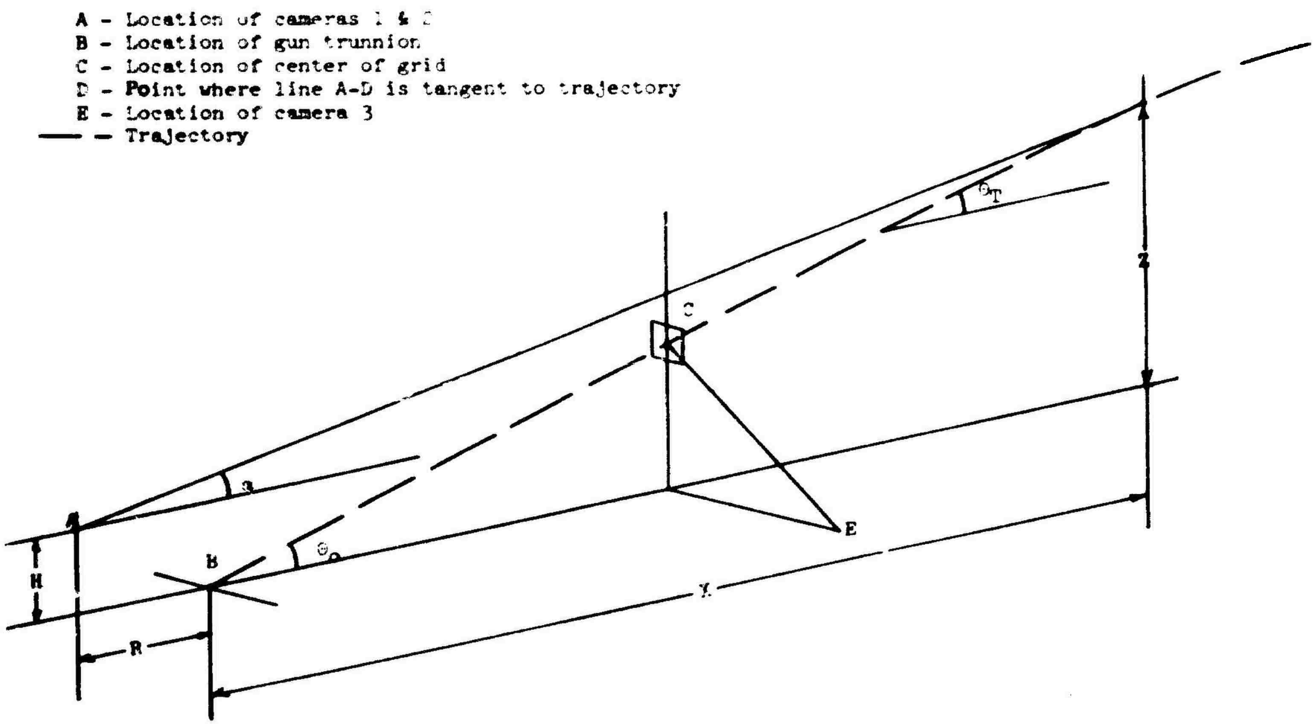


FIGURE 1

Geometrical Arrangement for Gun Jump Tests

Method II

A scaled rectangular grid was placed at point C and centered by boresighting. The projectile was photographed passing through the grid from points A and E. The displacement of the projectile from the center of the grid after subtracting trajectory drop distance, determined from particle trajectory data, gives the resulting angular displacement.

Method III

This method involves comparing observed ranges with theoretical ranges and computing gun jump based on the difference between the two.

Results

On 2 November, three rounds were fired at three degrees elevation with equipment set for applying the three methods. The camera set to observe point D (Method I) was not successful, however, because the angle α could not be estimated closely enough prior to the test. Method II yielded gun jump values of 4.14 minutes for round one and -1.07 minutes for round two. The camera at point A failed for round three. Method III gave a difference in departure angle between rounds one and two of 2.4 minutes. These results do not demonstrate a consistency needed for a good experiment and additional effort is needed before conclusions can be drawn.

APPENDIX J

8"0 MCLGM TECHEVAL Blast Test Data
Figure 1
Table J-1

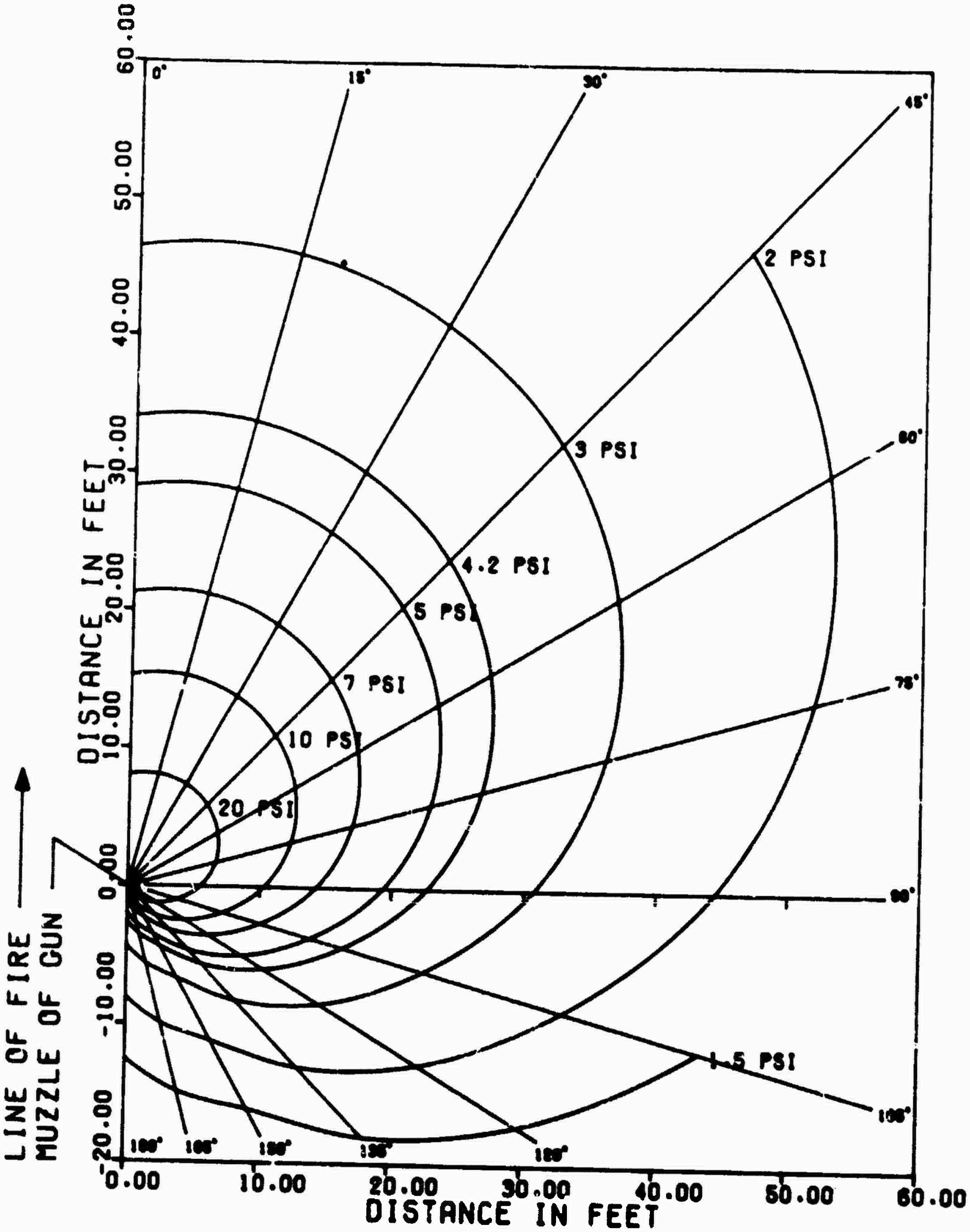


FIGURE 1

Free-Air Peak Overpressures for 8-Inch/55 MCLG Mount

TABLE J-1
EX 71 MOD 0 8"/55 MCLGM
TABULATION OF BLAST DATA

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
7.5	43.0	5	3.7	26.6	6.7	
			3.7	26.0	4.3	
			3.3	26.5	4.7	
			3.6	27.5	6.4	
			3.4	29.2	6.7	
		Averages:	3.5	27.2	5.7	7.3
7.5	54.0	5	2.6	36.2	6.3	
			2.4	36.1	4.6	
			2.4	37.1	6.6	
			2.2	35.7	6.8	
			2.5	36.2	7.1	
		Averages:	2.4	36.3	6.3	5.6
15	21.5	5	7.5	12.0	3.7	
			7.6	12.3	3.7	
			6.5	13.5	4.1	
			7.0	13.2	4.6	
			6.8	13.4	2.8	
		Averages:	7.1	13.4	3.8	9.9
15	44.0	5	3.4	27.7	5.4	
			3.8	27.1	4.9	
			3.5	27.2	5.3	
			3.3	28.6	5.1	
			3.2	30.0	6.4	
		Averages:	3.4	28.1	5.4	6.9

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired		Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
15	56.5	5		2.6	38.8	6.4	
				2.5	38.7	6.0	
				2.5	39.7	5.3	
				2.4	38.3	5.9	
				2.3	38.7	7.5	
			Averages:	2.5	38.8	6.2	5.6
30	22.5	5		6.7	11.9	5.1	
				7.4	11.8	4.4	
				6.4	11.4	4.5	
				6.4	12.9	2.9	
				6.5	14.3	4.3	
			Averages:	6.7	13.3	4.4	10.7
30	50.0	5		3.0	34.0	5.5	
				2.7	33.8	7.2	
				3.1	35.0	4.5	
				2.9	33.5	5.4	
				2.9	33.9	5.4	
			Averages.	2.9	34.0	5.6	6.1
30	72.5	5		2.0	52.6	2.5	
				1.8	51.0	3.3	
				1.6	51.1	2.9	
				1.5	52.5	3.3	
				1.4	54.1	3.7	
			Averages:	1.7	52.3	3.1	1.9

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
45	20.0	5	6.4	12.0	3.9	
			6.7	12.1	3.1	
			5.8	11.9	3.6	
			6.4	11.9	3.3	
			6.2	11.9	2.8	
		Averages:	6.3	11.9	3.3	7.8
45	41.0	5	3.5	28.0	4.1	
			3.7	28.1	5.8	
			3.9	28.0	5.0	
			3.9	27.9	4.7	
			3.6	27.9	4.9	
		Averages:	3.7	28.0	4.9	6.7
45	61.0	4	2.4	42.1	4.0	
			2.3	41.9	4.7	
			2.3	41.8	4.5	
			2.2	41.9	4.3	
		Averages:	2.3	41.9	4.4	3.7
45	71.0	1	1.6	52.7	5.7	3.4
60	17.0	5	9.6	10.9	2.6	
			9.8	10.5	3.5	
			9.8	10.5	2.6	
			9.9	10.1	3.0	
			10.1	10.4	1.9	
		Averages:	9.8	10.5	2.7	9.9

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
60	35.5	5	3.7	23.4	4.9	
			4.0	22.8	3.9	
			3.9	22.9	4.7	
			3.5	24.2	4.6	
			3.8	25.7	4.2	
		Averages:	3.8	23.8	4.5	6.3
60	52.5	5	3.1	29.8	4.4	
			3.1	29.7	4.1	
			3.2	30.7	4.4	
			3.1	29.3	4.2	
			3.2	29.8	3.8	
		Averages:	3.1	29.8	4.2	4.8
75	13.6	5	11.4	8.9	2.2	
			8.8	7.4	2.3	
			8.8	8.8	2.3	
			8.7	10.3	2.2	
			Instrumentation Malfunction on 1 Rd.			
		Averages:	9.4	8.8	2.2	7.8
75	30.0	5	3.8	20.9	3.9	
			3.8	20.9	3.7	
			3.7	20.9	3.8	
			3.7	20.5	3.9	
			3.8	20.8	3.6	
		Averages:	3.8	20.8	3.7	5.1

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
75	44.5	5	2.2	31.7	4.9	
			2.5	31.1	5.2	
			2.4	31.2	4.6	
			2.3	32.6	4.1	
			2.3	35.7	3.8	
		Averages:	2.3	32.4	4.5	3.9
90	10.0	5	12.0	7.3	1.6	
			11.3	7.3	2.0	
			10.5	7.1	1.9	
			11.6	7.1	1.7	
			10.9	7.1	1.8	
		Averages:	11.3	7.2	1.8	7.5
90	26.2	5	3.3	19.2	3.4	
			3.3	19.1	4.2	
			3.3	19.0	3.3	
			3.3	19.0	3.9	
			3.5	19.0	4.2	
		Averages:	3.3	19.1	3.8	4.7
90	42.0	5	1.9	32.0	3.7	
			1.8	31.9	4.4	
			2.0	31.7	3.3	
			1.8	31.7	3.2	
			2.0	31.8	3.8	
		Averages:	1.9	31.8	3.7	7.8

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
105	7.0	5	9.3	5.7	1.3	
			10.6	4.2	1.5	
			9.4	4.3	1.4	
			10.3	5.7	1.5	
			9.3	7.1	1.4	
		Averages:	9.8	5.4	1.4	14.3
105	17.0	5	4.0	12.6	2.6	
			4.0	12.6	2.7	
			4.1	12.6	2.5	
			4.4	12.3	2.4	
			4.2	12.8	2.4	
		Averages:	4.2	12.6	2.5	3.9
105	27.0	5	2.4	20.7	3.2	
			2.3	20.7	3.2	
			2.5	20.7	3.2	
			2.2	20.4	3.1	
			2.5	21.0	3.2	
		Averages:	2.4	20.7	3.2	2.8
120	5.6	5	8.7	5.2	1.0	
			7.9	5.2	1.3	
			8.7	5.0	1.1	
			8.6	5.0	1.2	
			8.3	5.0	1.2	
		Averages:	8.5	5.1	1.2	3.6

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
120	14.0	5	3.6	10.6	2.2	
			4.2	10.0	2.4	
			3.5	10.1	2.5	
			3.4	11.6	2.2	
			3.5	12.9	2.2	
		Averages:	3.6	11.1	2.3	3.1
120	26.0	5	1.9	20.9	2.7	
			2.0	20.8	3.1	
			1.9	20.8	2.6	
			2.0	20.5	3.0	
			2.1	20.9	3.1	
		Averages:	2.0	20.8	2.9	2.1
135	4.2	5	5.8	4.4	1.0	
			5.1	4.4	0.9	
			6.8	4.5	1.0	
			6.4	4.1	1.0	
			6.1	4.4	0.9	
		Averages:	6.1	4.4	1.0	2.2
135	11.0	5	3.3	9.8	2.3	
			3.5	9.7	2.5	
			3.1	9.5	2.5	
			3.3	9.5	2.1	
			3.3	9.5	2.1	
		Averages:	3.3	9.6	2.3	2.7

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
135	22.0	5	1.8	18.9	2.4	
			1.7	18.8	2.8	
			1.6	18.6	2.2	
			1.7	18.6	2.6	
			1.7	18.6	2.6	
		Averages:	1.7	18.7	2.5	1.6
150	5.0	5	3.8	5.4	1.1	
			4.6	3.9	1.3	
			3.2	4.0	1.1	
			3.6	5.3	1.1	
			3.9	6.7	1.2	
		Averages:	3.8	5.1	1.2	1.6
150	9.0	5	2.6	8.4	1.9	
			2.7	8.4	1.9	
			2.8	8.4	1.5	
			2.7	8.1	1.7	
			2.8	8.4	1.6	
		Averages:	2.7	8.3	1.7	1.7
150	13.5	5	1.9	11.2	2.5	
			2.1	10.8	2.3	
			1.9	11.0	2.2	
			1.8	12.3	2.1	
			2.0	13.6	2.4	
		Averages:	1.9	11.8	2.3	1.6

TABLE J-1 (Continued)

Angle from Trajectory (Degrees)	Radial Distance From Muzzle (Feet)	No. of Rounds Fired	Free-air Peak Overpressure (PSI)	Shock Arrival Time (MS)	Positive Pulse Duration (MS)	Positive Impulse (PSI-MS)
165	5.8	5	2.7	6.4	1.6	
			2.9	6.3	2.2	
			2.8	6.2	2.2	
			2.9	6.1	1.4	
			2.8	6.1	1.8	
		Averages:	2.8	6.2	1.8	1.9
165	9.0	5	2.0	9.1	2.1	
			2.6	7.5	1.9	
			2.4	7.6	1.8	
			2.2	9.0	2.1	
			2.3	10.3	1.7	
		Averages:	2.3	8.7	1.9	1.6
165	13.0	5	1.7	12.2	2.5	
			1.6	12.4	2.4	
			1.7	12.0	2.2	
			1.7	12.0	2.4	
			Instrumentation Malfunction on 1 Rd.			
			1.7	12.2	2.4	1.5

APPENDIX K

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13. ABSTRACT

The prototype 8-Inch Major Caliber Lightweight Gun Mount, MARK 71 MOD 0 was subjected to a technical evaluation from 24 September through 12 November 1972. A description of the evaluation and test results are given, with tabulations of ballistic and mount performance parameters. Results and conclusions are discussed.

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